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The WESTON CADMIUM CELL

For nearly two decades the international standard of E.M.F.

The history of the WESTON Standard Cell

In the years immediately following the introduction and perfection of the Weston Direct Current Voltmeters the standards then available for standardizing these instruments were not deemed sufficiently reliable to meet the requirements of the new art.

The most generally accepted standard of E. M. F. at that time was the Clark Cell which could be reproduced with reasonable accuracy, but which had a large temperature coefficient. In order to improve this condition Dr. Weston entered upon a long series of experiments which culminated in the production of the Weston Cadmium Cell in two forms—one, known as the Standard Cell with an unsaturated solution having a negligible temperature coefficient and made in portable form for a working standard; the other, the Weston Normal Cell with a saturated solution which had a very slight temperature coefficient.

These cells were studied for many years by the Standardizing Laboratories of many governments including England, France, Germany and the United States. It was recommended that the Clark Cell be replaced by the Weston Cell at the Berlin Conference in 1905, and again at the London Conference in 1908. At this time a committee representing eleven countries was appointed to select a value for the Weston Normal Cell. This work was carried on at the Bureau of Standards, Washington, during 1910 and on January 1, 1911, the Weston Cell was adopted officially as the International Standard. This same cell was actually used as the standard, but unofficially, many years prior to its final adoption.

Weston Model 4 Standard Cell

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Thus the Weston Standard Cell as now constructed has entered the realm of portable instruments and while it is always advisable to handle a Standard of such extreme precision with care, the new form of Cell can be readily transported without fear of injury. This important development in the Cell greatly extends its field of usefulness.

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The consolidation of Electrical World, Electrical Engineer and American Electrician

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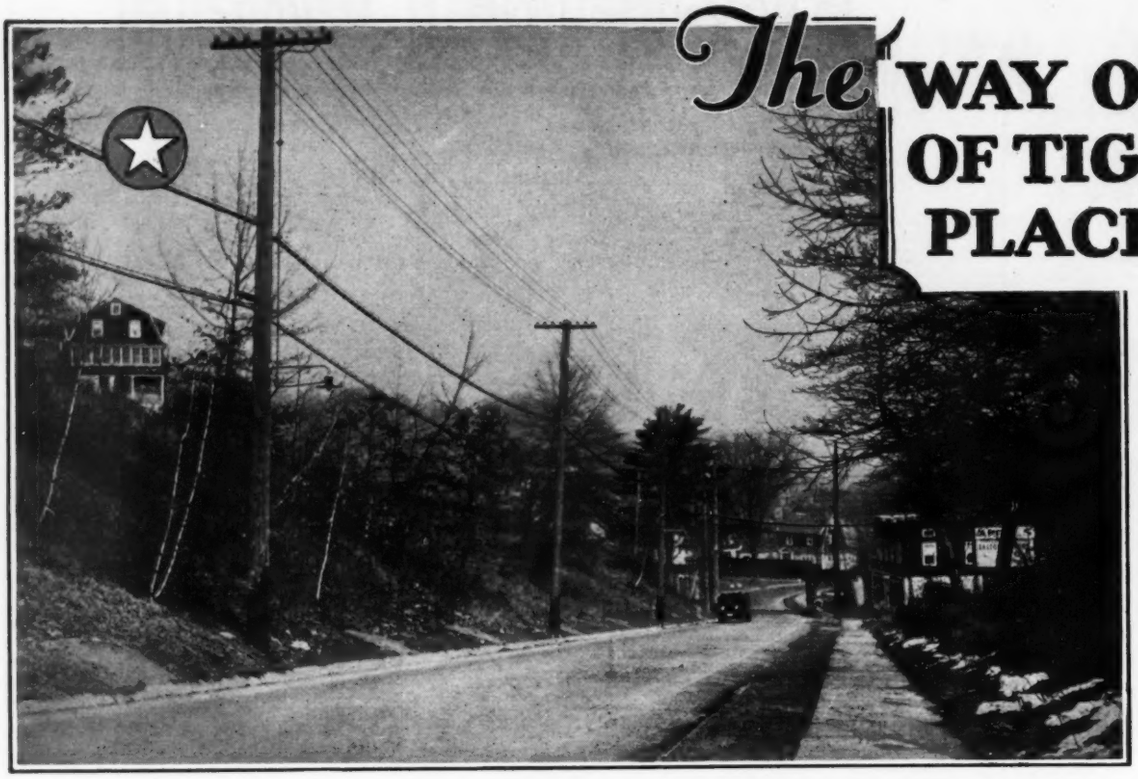

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Utilities Desire Short-Wave Allocation

IN THE near future a conference is to be held in Washington to discuss short-wave radio allocations to different agencies on this continent. The light and power industry is interested in this conference because it believes that it will be for the public good in the largest sense if short-wave radio allocations are made to the utilities.

Under storm conditions telephone communication is apt to fail, and on large utility systems short-wave radio is essential to communication service under emergency conditions. When electric service is interrupted cities become dark and crime is encouraged, water supplies may be cut off, bringing about fire hazards and dangers to the public health, and industries may be stopped, thus placing a heavy economic burden upon the community. To maintain good service and to restore service quickly it is essential that communication be available, and short-wave radio has proved very valuable for this purpose.

In addition to communication, there are other applications of short-wave radio which utilities will use to improve electric service or to reduce the cost of service. The remote control of street lights, of switches, of generating stations and of motor operations by short-wave radio is just on the horizon, and the vacuum-tube relay offers very great possibilities for many other control and signal applications on large utility systems. The art is new as yet, but the future applications can be visualized. It is to be hoped, therefore, that the commission will favor the allocation of high-frequency radio to the power companies. Commissioner O. H. Caldwell is already on record as saying that such an allocation would be in the public interest, and the other members will no doubt agree with him if they get a thorough knowledge of the things involved.

* * * *

Psychology of Prosperity

SEVERAL years ago a mild-mannered little man, not without followers in his own land, visited this country and exhorted us to dissipate our mental and physical ills by the somewhat ingenuous repetition of a homely phrase, "Every day in every way I am getting better and better." There was a measure of merit in the little man's suggestion. Assuredly ills of the flesh are often but reflections of mental moods.

The activities of industrial life are no less closely allied with the psychology of business. Why not a little Coué-ism for ailing industry? What is the matter with business? Thousands of times daily is the question offered in press, meeting and conversation. The answer is invariably the same. Fair volume, with few exceptions. Minimum profits. Tremendous amounts of money available and bringing in low returns. Is the difficulty capable of solution through "thinking prosperity"? To stimulate the situation there are needed gainful trading margins —the payment of a fair price for manufactured products. There is, however, another closely related factor in the situation. The producing capacity of American industry has outgrown the present demand for the finished product, and prices which have been based upon full output cannot be maintained profitably for lesser volumes. Buyers are not curtailing purchases to the detriment of their needs. There is a healthy, conservative buying.

The solution lies in recognizing a curtailed production as an acceptable thing and raising prices to a profitable basis. Prosperity, as well as depression, is largely a state of mind for individuals, industries and nations. In this instance it means "fair-price consciousness."

* * * *

Legal and Moral Effect of Engaging Outside Counsel

RECENT failures and threatened failures of important dams have brought the subject of the safety of such structures prominently before the public. Apprehension has been aroused concerning many large dams whose security had hitherto been unquestioned. Large numbers of them are owned by public utilities; hence the industry has a vital interest in their integrity. The destruction of one or more of the larger power or reservoir dams, attended by extensive damage and perhaps loss of life, would tend to undermine the public confidence in utility companies which has been built up over a long period of years.

The owners of existing or proposed dams owe a duty to themselves and to the public to see to it that the structures for which they are responsible are safe so far as is humanly possible. Yet published records of actual and narrowly averted failures usually disclose either conditions which might have been remedied or a failure to observe practices or precautions which might have been adopted had competent engineering and geological advice been sought or heeded.

In no undertaking is the element of judgment called into greater play than in the construction of an important dam, especially where foundation and geological conditions are uncertain or obscure. Yet there are numerous instances where individuals with little or no special training and relying on their own personal judgment and skill have carried out the planning and construction of dams of great height or impounding large volumes of water. A sense of responsibility to stock and security holders, as well as considerations of public policy, is usually sufficient to cause the executives of utility companies to take all

reasonable precautions to assure themselves of the adequacy of their plans and structures. Unfortunately, however, there are those who, through ignorance or carelessness, are not so scrupulous.

There are many competent consulting engineers and geologists whose services are available to clients contemplating the construction of important dams or concerned with the safety of existing structures. While the judgment of the company engineering staff may be of the highest order, its confirmation by independent experts will have a value out of all proportion to its cost. In the case of an accident the fact that the best expert advice was sought and followed will have a favorable effect of no small weight both from a legal and a moral standpoint.

* * * *

"Old Heads" Needed for Industrial Heat Application

INTELLIGENT application of electric heat to industrial processes requires something more than unbounded enthusiasm and a speaking acquaintance with thermal equations. Commendable and necessary as these requisites may be in the make-up of the industrial heating sales engineer, they should be tempered and seasoned with other qualifications of equal, if not greater, importance. It has been stated and often repeated that the secret of industrial heat application is the sales engineer's familiarity with manufacturing processes. A little further examination of the records of those who have done outstanding work in developing the heating load shows that there are other elements which have built up an essential background of experience and knowledge. These qualifications have been a thorough acquaintance with motor application, familiarity with industrial plant layout and processes, familiarity with central-station practice and rates for service, knowledge of power plant, steam and mechanical equipment, and, finally, some executive ability. In other words, building the industrial heating load is no job for a novice.

Some power companies have realized the need for seasoned experience and accordingly have charged either the chiefs of their power sales departments or a senior salesman with this responsibility. Other companies—too many in fact—have fallen into the habit of "wishing" on newly recruited power salesmen those tasks which required the most development work involving much research and long-drawn-out negotiations. Industrial heat applications often come under this category, and the power company just about as often loses a prospective heating load because a junior salesman did not have the necessary background to "carry through." He did not know when to call on the manufacturer for help as an older head would have done. The usual excuse for such a practice is that the new man "needs the training" or "the experience will do him good."

Power companies need the industrial heating load; they need sales man-power to get it, but they also need in this man-power the sales engineering experience of their present power sales force, which is already familiar with industrial plants and processes and acquainted with the personnel in local manufacturing establishments. Proper application of industrial electric heating equipment is a further refinement in the electrification of industry, and it needs the seasoned experience of the men who have been through the mill in the application of electric motors.

Keep the Yardstick True

COMPARISONS of the use of electric service in residences are becoming popular among utility sales managers. One group of seven Eastern companies, for example, exchanges a monthly tabulation of kilowatt-hours consumed per customer, and considerable friendly rivalry has resulted. Over the past six years substantial gains in the use of electricity in the home have been recorded, and all of these properties are on the way to achieve a 400-kw.-hr. to 500-kw.-hr. average within the next year or two, barring unforeseen developments unfavorable to business conditions. These figures are, of course, lower than the present usage on many properties where heavy-duty household devices have been very widely accepted, but they represent increases of anywhere from 18 to 65 per cent over the former business of the participating companies. The interpretation of such interchanged data is the real problem and suggests a few comments of general application.

In comparing the extent of residential usage, it is important to co-ordinate the statistical methods employed, to recognize the differences between properties which may affect the figures obtained, to have at hand an accurate history of recent rate changes, and to possess reliable information as to the extent of residential service on each company's books in proportion to the potential market. There are more variables bearing upon the density of home service from central-station lines than many commercial men appear to realize. In the past confusion has at times arisen from attempts to draw conclusions from such data as to the commercial enterprise of one company as against another.

There has been a tendency to credit particular forms of promotional-type rates with the lion's share of progress when it has been evident that rate reductions in whatever shape have stimulated usage because the total monthly bills of customers have not increased anywhere in proportion to the gain in energy consumption. This is nothing against inducement rates—we believe in them most heartily—but if there is to be an avoidance of a crooked yardstick in gaging residential service growth, there must be caution about attributing specific gains to particular factors affecting usage unless the evidence is unmistakable. The industry must see to it that its data embrace the entire usage of electricity per home covered and must "watch its step" to guard against tripping over such exposed roots as special residential power rates, service to household garages through separate meters, renewal policies as to lamps, pitting urban against rural lines, and so on.

Finally, the economic side of this problem presses for greater study. Unless earnings per residential customer increase with the years, gains in his use of energy are small cause for congratulation. Revenue will naturally increase at a considerably lower rate than consumption under first-class rate systems, but it should grow materially, when the customer derives the benefit of receiving lower prices per unit. It is desirable that utilities exchanging residential service data shall periodically include statements of income received from this class of business and that friendly competition shall consider this result no less than the kilowatt-hour index. Anything that stimulates analysis of class business among utilities deserves encouragement, but such comparisons as the foregoing cannot be taken too literally without danger of overlooking potent factors in the final statistical product.

Stocktaking on the Hearings of the Federal Trade Commission

FROM any point of view the light and power industry is sound. Its operations and progress are controlled by experienced and able executives who combine business ability with those ideals of service essential to successful public utility management. The industry has an established and enviable reputation because it has done a splendid job in bringing electric service into American life.

These facts should serve to orient any situation developing from time to time that affects the industry such as the Federal Trade Commission investigation. This investigation is an incident in the progress of the industry. There should be no exaggerated reaction to the testimony brought out to date and there should be complete confidence in the final results of the investigation. The light and power industry is on record as welcoming any fair investigation and has fully co-operated in the present one. Electrical men believe that the record of performance of their industry will stand the full test and that when the full facts are understood its work will merit public commendation. The editors of the ELECTRICAL WORLD have endeavored to interpret the hearings and to make constructive suggestions helpful to the industry in improving its publicity program. A brief recapitulation of the situation is now given in the hope that this will still further give the investigation its proper aspect in the minds of ELECTRICAL WORLD readers.

The hearings of the Federal Trade Commission to date have dealt with the surface aspects of one phase of public utility operations—the work of the information bureaus. The chief direct result has been many newspaper articles that repeated portions of the testimony which, in the absence of interpretation, correct correlation or elaboration—and these were not permitted under the commission procedure—caused some unfavorable public reaction to the practices of some employees of the public utility information bureaus.

Clear differentiation should be made between what has actually been done and that which has been written about in a mass of correspondence between hundreds of individuals over a period of years. It is also easy to overpicture the real public response to the newspaper articles. The meat of the investigation will be found later when the data on utility operations compiled by the commission comes to be discussed in the public hearings.

EXECUTIVES of the light and power industry and the editors of the ELECTRICAL WORLD believe the utilities have the right and the obligation to tell the facts about their operations to the public they serve and to their investors and to answer questions for information that may be submitted. Further, they believe that the industry has the right and the obligation to fight openly and vigorously false statements about the utilities and mistaken economic principles whose acceptance would jeopardize the development of electric service in this country. This publicity program of the utility companies has been based on good principles of organization and a sound business philosophy and it has achieved very desirable results. Publicity work must be continued, and the utilities will profit from the investigation in improving their method of procedure.

The hearings of the Federal Trade Commission produced evidence that the publicity material supplied by the industry was in virtually all instances true, fair and of a type that should be made available. Out of all the school pamphlets, for example, criticism of the material has been made only of two paragraphs from one 49-page pamphlet issued in a single state. This itself attests the care exercised by the many individuals involved in the preparation of the pamphlets. Any distortion of this conclusion was caused by the procedure under which the commission is required to work or by inferential treatment by some newspapers of a few unwise and bragging letters written by information bureau employees to their friends or to industry executives. It is remarkable that among the many publicity men so few were overzealous and unwise and that in a very difficult field of operation inexperienced supervision produced so few mistakes.

As already remarked, unfavorable public reaction resulted from newspaper reports which exaggerated the importance of these few examples of unwise publicity activity, and doubt or question has been raised in the minds of many citizens, with respect not so much to their local utility as to the light and power industry as a whole. People understand and know the performance of their local utility and only need to be assured that it is typical of the entire industry. For this reason the action of individual bureaus which, after the garbled accounts of the investigation began to appear, sent statements to the people of their commonwealth telling about the work and purpose of their own bureau is to be commended. Full understanding is what is needed.

THE industry should go forward with its publicity program with courage and confidence, benefiting by any mistakes that have been made in the past. Closer executive supervision of publicity work is recommended. Publicity men should have more thorough knowledge of the basic principles of the industry and its accomplishment and of the real purposes of the industry in its publicity efforts. Each local property should make publicity work a part of the executive program and care should be exercised that all publicity work is in good taste.

The state publicity problem is most difficult. The information bureaus were established to meet a criticism once focused upon the industry to the effect that it was secretive—that it did not give out information with regard to itself. The information bureau was a logical agency; with the large number of independent companies operating in a state the bureau was a logical means for explaining utility development to the state. These bureaus were independent, composite organizations, including gas, street-railway, light, power and often telephone utilities. In some states there appears to be unfavorable sentiment to these bureaus and to the name adopted for the state agency. In view of this fact, it would seem advisable for utility executives in each state to decide upon state publicity work adapted to their own state situation. In all cases better news value should be derived from state association meetings by having a program that devotes more attention to a résumé of utility progress. All suggestions for improving publicity work will no doubt receive the serious consideration of industry executives. The need for publicity is undiminished, and we repeat, the federal investigation will help the industry to improve its publicity program.

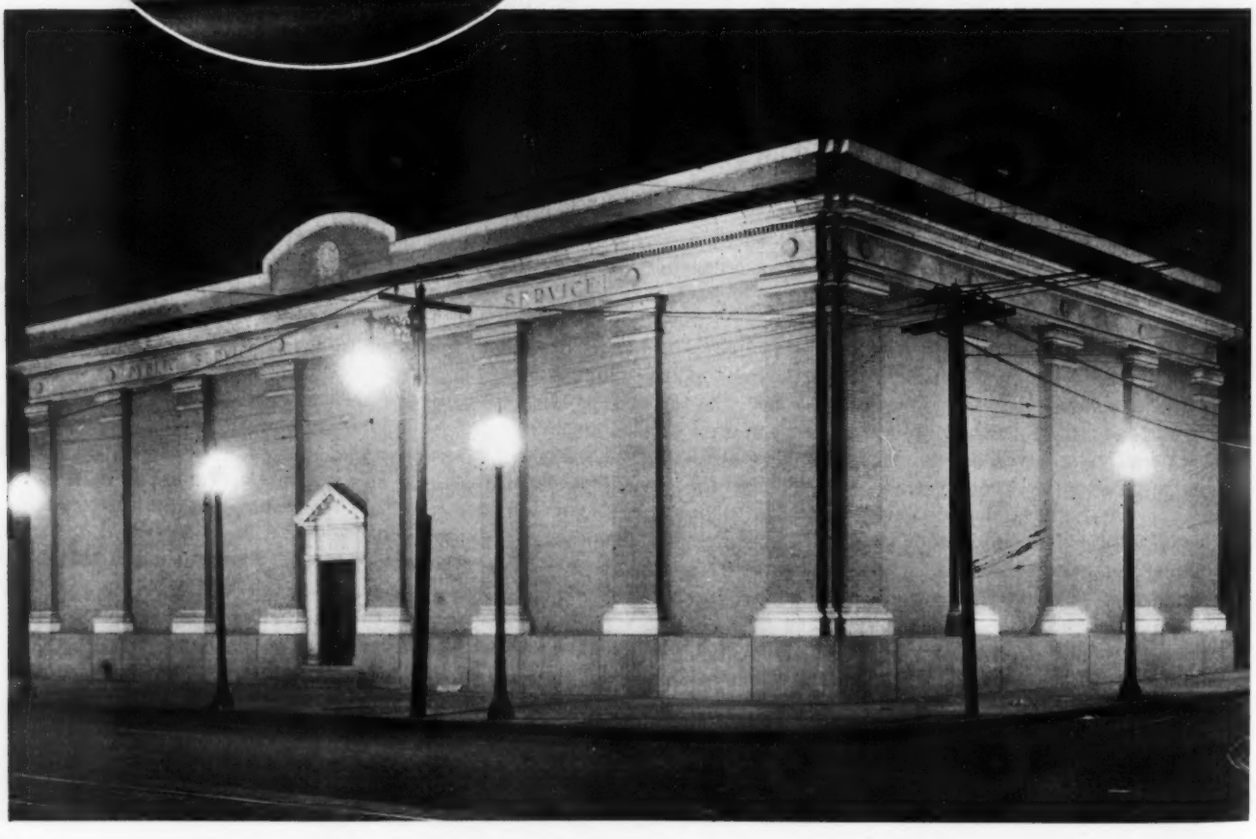
Combined Street and Flood-lighting

FOLLOWING the first installation of a new method of floodlighting at the Roxy Theater in New York City, the Public Service Electric & Gas Company has made several installations of combined floodlighting and sidewalk and highway illumination in the New Jersey communities which it serves. Details of the plan are given on page 255 of this issue.

Above—Bank building gains prominence and protection.

In circle—Building entrance effectively lighted.

Below—Miller Street substation becomes a community landmark.



Favors Supervisory Control
for Substations

All late stations of Toronto Hydro-Electric System are equipped with supervisory control. Construction economies and operating advantages dictated use

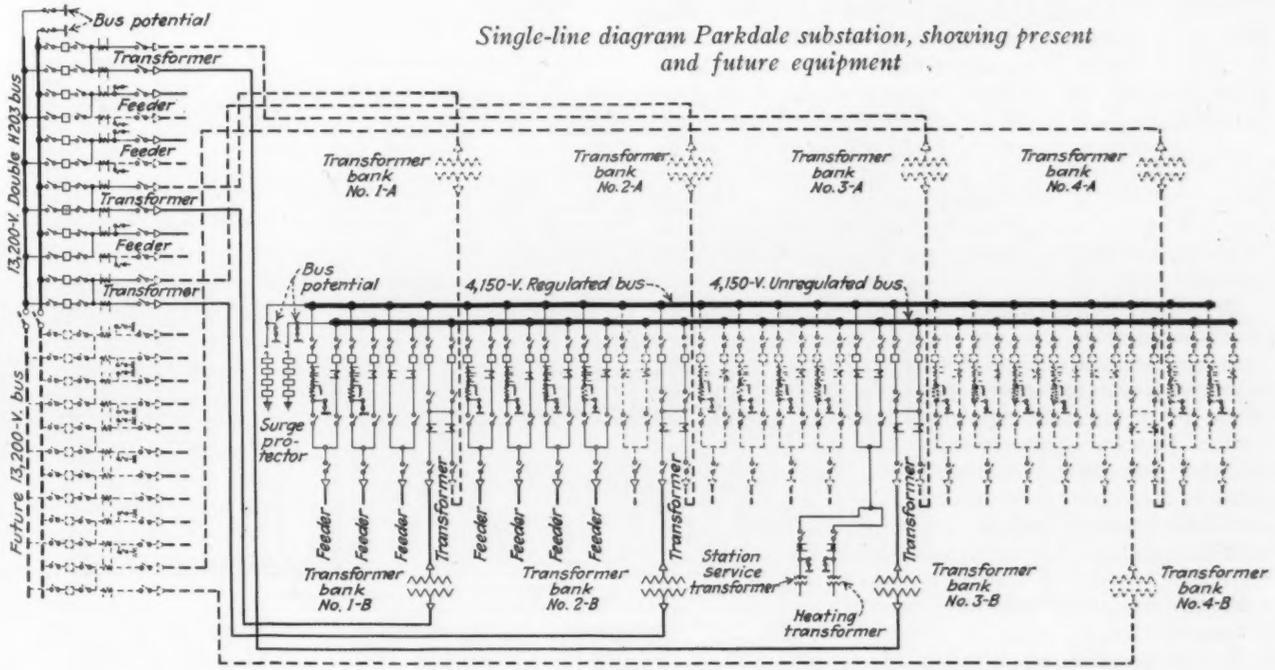
By W. F. SUTHERLAND
Toronto Hydro-Electric System

THE UNATTENDED urban substation offers a solution for many of the problems confronting the engineer in the design of city distribution systems. While admittedly ideal for remote hydro-electric plants or distant substations in isolated locations, supervisory and automatic control also have advantages where heavy loads are encountered and the ratio of operating costs to installed capacity is not so greatly in need of reduction. Economies in this direction are still evident, and it has been found that in stations of reasonable size the saving in control conduit, cable and switchboard space not infrequently goes a long way toward paying for the supervisory control equipment required.

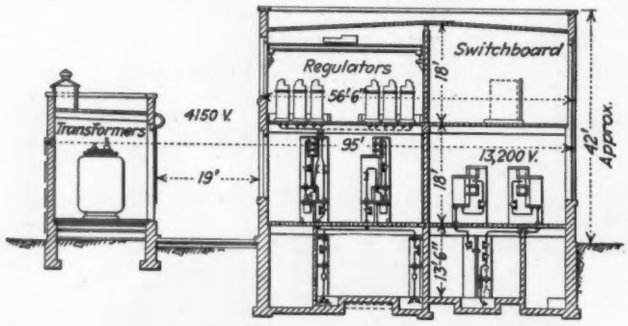
An interesting example of supervisory control applied to a city distribution system is to be found in Toronto, where the stations built in the last few years progressively reflect the progress made in the application of this comparatively new development. In recent construction work a distinct trend toward the elimination of operators is evident and it is doubtful if any more attended stations for either traction or 4,150-volt distribution work will ever be built by the Toronto Hydro-Electric System. Four stations are now supervisory controlled, the Danforth 4,150-volt substation, the Wiltshire 4,150-volt substation, the Wiltshire 13,200-volt switching station and a smaller substation of older type on Defoe Street which is being rehabilitated. Another 4,150-volt supervisory controlled substation, Parkdale, located on Queen Street, West, has been recently completed and is carrying load. The Danforth station is located in the center of a rapidly growing district. It has been laid out to take care of future expansion and has a capacity of 18,000 kva. in alternating-current, 4,150-volt distribution, with provision for 2,000 kw. in direct-current traction load in addition. Of this amount, 15,000 kva. in 13,200/4,150-volt transformers has been installed and one unit of the two-unit automatic converter equipment is now in operation.

At the time when this station was being designed supervisory control was somewhat of an innovation for stations of the size contemplated. Accordingly, it was thought desirable to make complete provision for manual

Single-line diagram Parkdale substation, showing present and future equipment



operation in case of necessity. Space was allocated to a control room immediately over the 13,200-volt switching equipment. This location made for a most convenient conduit layout, all controls being run in the main floor, up the center division wall, through the reinforced concrete beam at the top and thence through the switchboard



Cross-section of Danforth station showing the general arrangement and subdivision for fire protection

floor to the control pit at the back of the main switchboard. The switchboard panels were grouped more or less according to breaker location, eliminating the crossing of control cables in the pit at the rear. These cables terminate on terminal blocks in the pit and the individual leads are carried up in channel-shaped sections, also supporting the panels, to a point nearest the control apparatus to which they attach. Certain of the leads from the breakers are used for supervisory purposes, and these, together with control leads to the master supervisory control relays, carry through to the top of the board and into a longitudinal trough at the top to the center of the board, at which point contact is made between supervisory apparatus and the station equipment proper.

The supervisory equipment is of the Westinghouse synchronous-relay type and control is provided for 50 breakers. All station equipment, even to the station service motor-generator set supplying the control battery, is supervised. The two-unit automatic converter equipment is also supervised through the two bus breakers and is normally started and stopped by energizing the converter bus. The station is controlled from Carlaw substation, about 2 miles distant.

Special attention was given to adequate fire protection with transformers in isolated pockets outdoors, the station proper being divided into units by means of fire walls and fire doors.

The Wiltshire Development

Supervisory control was next applied to a station of slightly different type and larger capacity. The Hydro-Electric Power Commission of Ontario was erecting an outdoor transformer station of 45,000-kva. capacity on a site convenient to the old Toronto & Niagara Power Company's right-of-way.* This station on Wiltshire Avenue stepped the transmission line voltage of 110,000 down to 13,200 for city distribution by the Toronto Hydro-Electric System. An indoor station was erected by the latter organization for the termination of its feeder cables and to provide the necessary switching facilities. This station is known as Wiltshire "A." Adjacent to it and on the same site a 4,150-volt substation was also erected, deriving its high-tension supply from the "A" unit adjoining and having an ultimate capacity in 3,000-kva. banks of 24,000. This station is known as Wiltshire "B."

Both are supervisory controlled, two separate and distinct units (Westinghouse synchronous-relay type) being installed, and both are controlled from the West Toronto substation, about 1½ miles away.

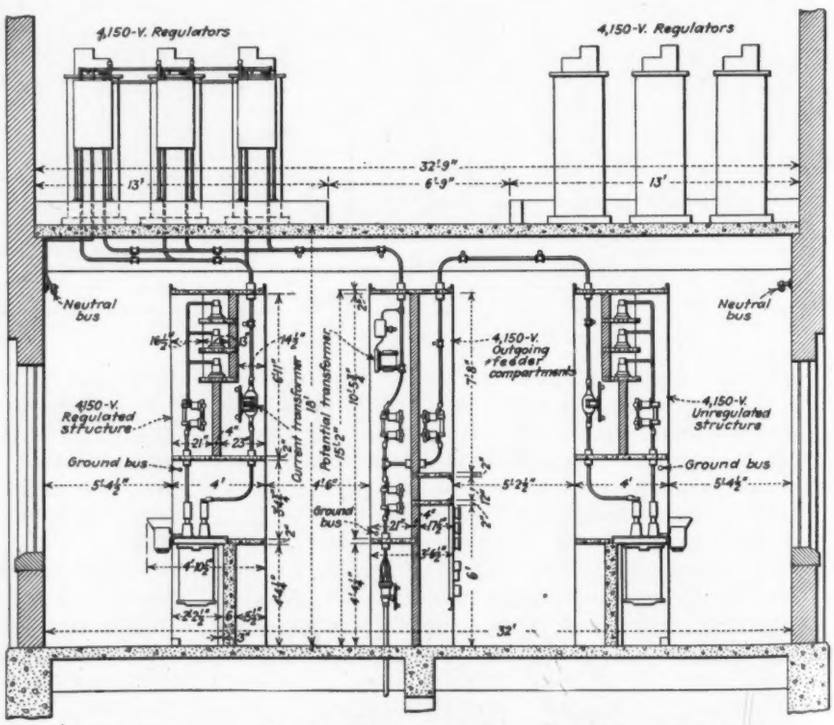
These two stations mark an entirely new departure in substation design, being laid out to take advantage to the utmost of the economies afforded by supervisory control. No space has been allotted to switchboards in either and each feeder or transformer unit is complete in itself, all control equipment, relays and other apparatus being contained within the longitudinal space occupied by the circuit breakers themselves. In other words, such of the switchboard as has been retained has been split into its component panels and these panels placed in the structures opposite the circuit breakers.

Economy of Construction

At first glance the economy of this construction may not be apparent, but the following figures may be of interest in this connection:

Conduit and control cable saved in 13,200-volt station	5,800 ft.
Space saved through elimination of control room	6,324 cu.ft.
Conduit saved in 4,150-volt station	4,700 ft.
Space saved through elimination of control room	6,324 cu.ft.

These items, together with other economies, result in a saving in capital cost of about $20,000, offsetting ma-

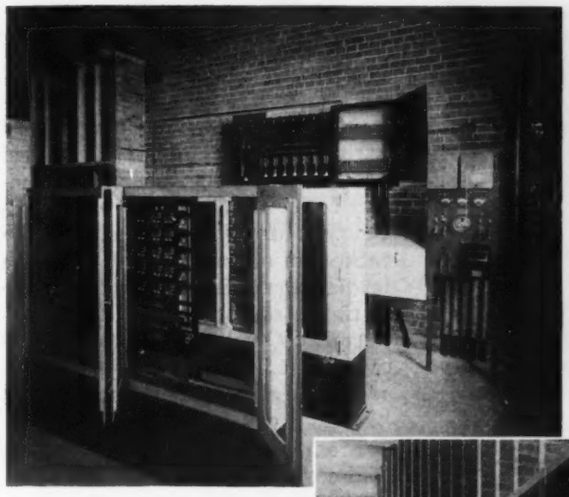


Detail cross-section, 4,150-volt portion, Parkdale substation

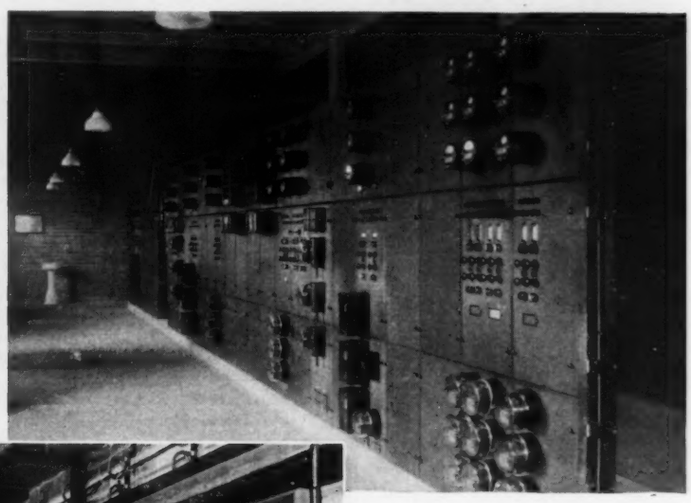
*"Electrical World," Vol. 86, No. 12, 1925, page 552.

terially part of the additional cost of supervisory control. The station layout has been simplified. A large station presents few difficulties in design not encountered in the smaller one, except in the matter of conduit and control. The routing of the miles of conduit required, finding locations to stow it away in and provision for the isolation of individual circuits are all matters requiring much care and thought in stations of any magnitude. On the other hand, such conduit as is required in supervisory-controlled stations can readily be limited to the few runs from breakers to panels in the same bays with little or no conduit running longitudinally of the building. This project has been described elsewhere,† and since the ing trough, continuous throughout the structure and completely isolated, above. Two hinged panels are provided for each feeder or other unit. One serves to mount the supervisory relays, the hand control, pull buttons, the demand ammeters and transfer switches for switching from supervisory to hand control. The other panel is reserved for protective relays.

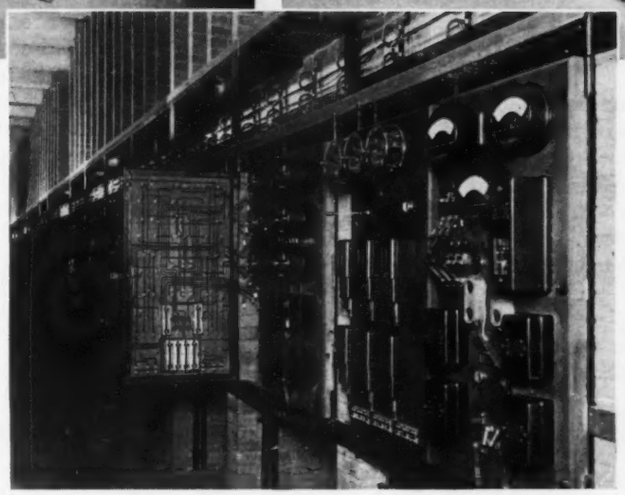
Throughout, extreme care has been taken to insure safe and reliable operation. No soldered joints exist in the run of the conductors from the buses to the circuit breaker, the connections being all bolted or threaded. C.G.E. H-206 breakers are used and bus supports, disconnecting switches and all other pieces of apparatus



Supervisory equipment in West Toronto station, controlling Wiltshire



Switchboard of Danforth substation. The supervisory M.S. relays are seen in the center of the board



Hinged control and relay panels in the Wiltshire "A" station, located in one of the structures, with the supervisory wiring trough above

4,150-volt station has much in common with the new Parkdale station described below only a few comments will be given concerning the 13,200-volt switching house or "A" unit. The accompanying cross-section shows the general arrangement adopted. Double buses are provided, space has been left for reactances and the feeder structure has been arranged for the taking away of split feeders. Each pair of breakers, one to each bus, takes care of two separate feeders of 250,000 circ.mil area each. Under ordinary conditions both are operated as one unit, although in case of trouble any cable may be operated individually, its paired cable being isolated by the usual disconnecting switches. Balanced relay protection is provided. This illustration also shows the location of the control panels and supervisory wiring trough. The panel location will be seen in the left-hand portion of the disconnecting switch structure located on the main floor, with the wir-

†*"A 45,000-Kva. Station With Supervisory Control," W. F. Sutherland, "Electrical News," Toronto, Vol. 25, No. 21, 1926, page 29.*

have been bought to rigid specification, ample factors of safety being allowed both as regards flashover and mechanical strength. Cranes serve the breakers on both floors and it is interesting to note that they nearly paid for themselves on the initial installation.

The Parkdale station, now under construction, is an excellent example of the system's latest practice, and since it incorporates many of the features of the Wiltshire development it will be described in detail. It, like the 4,150-volt Wiltshire station, is of 24,000-kva. capacity, provision being made for eight banks of single-phase transformers, installed outdoors on concrete platforms, the space underneath being used as a pipe tunnel and cableway.

The station is tee-shaped, the front portion, facing on Queen Street, being used for 13,200-volt switching, with the battery room, entrance vestibule, supervisory control room and lavatory located in front on the ground floor. A portion of the basement, extending full width, is used as a cable vault. The rear portion of the building is reserved for 4,150-volt switching equipment, the transformer platforms flanking it on both sides.

The double-bus double-breaker scheme of connections has been employed throughout. For reasons of cost economy, consequent upon the increasing cost of breakers and equipment of the steadily mounting rupturing capacity required, it has become the practice to double-bank the 13,200/4,150-volt transformers, two to each switching unit where the banks each consist of three 1,000-kva., single-phase units. In stations of this size operating

Typical regulator installation employed by the Toronto Hydro-Electric System

flexibility is quite adequate, standard cabling is still possible and a material reduction in cost is achieved. It will be noticed that disconnecting switches are provided for individual bank isolation. The standard 4,150-volt feeder arrangement is also shown. Each feeder has a capacity of 500 amp., with 60-kva. regulators connected for 5 per cent regulation installed. The regulators are in the lead from one bus only. This arrangement permits running the feeder unregulated in case of regulator trouble. In an attended station the cutting out of regulators can be accomplished without interruption, but in an unattended one such as this a momentary interruption is necessary.

Provision is made in the 13,200-volt structure for two lead-covered cables into each compartment, thus providing for split or looped feeders. A sufficient number of cells are available for dual feeds from separate terminal stations and for several outgoing feeders.

Unit Bays Used

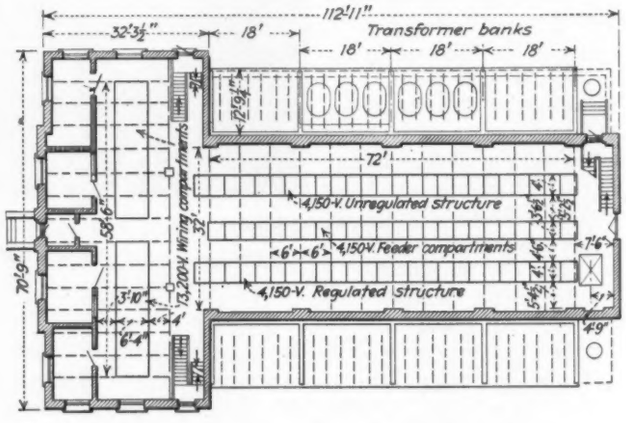
It has always been a matter of the greatest difficulty to achieve a satisfactory layout in the arrangement of regulated feeders, since three single-phase regulators, or even one of the three-phase type, occupy vastly more space lengthwise in a station than does the feeder compartment, thus creating a difficult cabling job. With the arrangement shown by the accompanying cross-section and floor plan this trouble has been entirely overcome. No bank of regulators is more than 3 ft. away from the oil switch compartment in a longitudinal direction and, moreover, every 18-ft. bay is complete in itself, two transformer banks with their secondary switching, five regulated feeders and one unregulated feeder forming a unit. It is thus possible to lay out one bay of a station and to repeat it as often as desired to obtain the desired capacity, adding part bays at each end, for stairways, service accommodations and the like.

The 13,200-volt equipment calls for no extended comment, C.G.E. H-203 circuit breakers being installed on the top floor, with disconnecting switches on the main floor and end-bell structure in the basement.

The cross-section shows clearly the general arrangement of 4,150-volt control apparatus in relation to the rest of the structure equipment. The center or feeder structure has been so arranged that one side is free of cabling or switches for about 8 ft. in height. Pockets are here available, on the front of which are mounted ebony asbestos panels, hinged to a rigid structural steel framework.

Above these is seen a longitudinal wiring trough continuous from end to end. This trough serves as a runway for control buses and for supervisory control leads. The latter are racked on either standard telephone bridle rings or iron brackets. In the Parkdale station special No. 4 conductor, 600-volt R. I. braid-covered cable is used for supervisory controls from breaker panel to terminal blocks on end of structure.

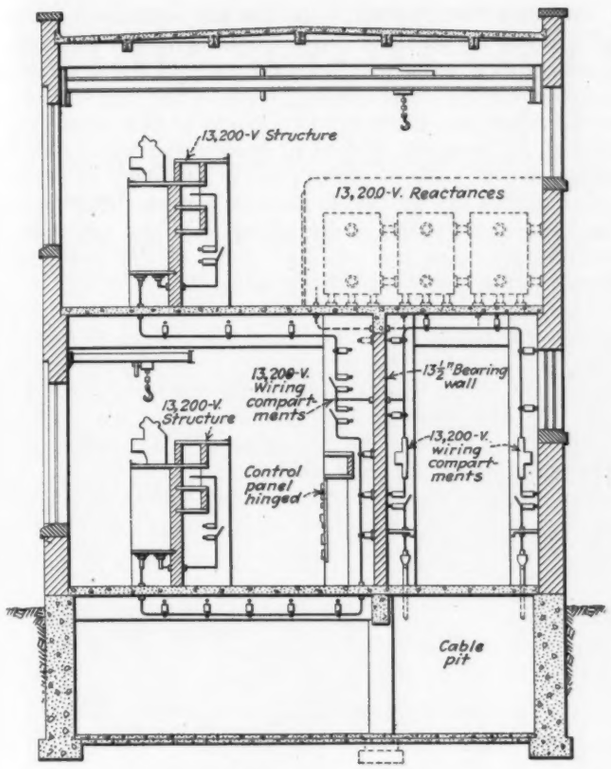
From these latter 25-pair, 16-gage, lead-covered, paper-insulated cable, 4,000-volt test, leads to the supervisory control equipment, housed in a separate room. This cable is standard interstation cable as used for telephone and supervisory work. The extremely small amount of control conduit required is evident by a glance at the cross-section. General Electric distributor type control is being installed, 40 controls now being equipped



Main floor plan, Parkdale substation

and provision being made for a future duplicate unit when required.

It may be mentioned in passing that the transformer banks, delta-star connected, have their primary deltas made in lead-covered cable, with no exposed conductors except at transformer terminals. The three-core primary cable is first split into three single-conductor cables and these latter are further joined onto two lead-covered,



Cross-section of Wiltshire "A" station. This is a 13,200-volt distribution station only

single-conductor cables, giving six, one for each transformer terminal, this being done in the cable pit underneath.

Demand Meters Used

The usefulness of the ordinary indicating ammeter on transformer or feeder circuits would appear to be limited to two functions: First, to give the operator something to do in the logging of half-hour readings; second, to give an indication from an inspection of the log sheets as to when the feeder or transformer is in danger of becoming overloaded. Since no operators are required in a supervisory-controlled station, the second function is the only one that need be considered, and this is much more satisfactorily taken care of by meters of the demand type. The instruments used on the control panels are not of the indicating type, but are thermal demand ammeters, especially developed for the Toronto Hydro-Electric System by the Lincoln Meter Company, and give an indication of the maximum demand in amperes which has existed on the particular feeder or piece of apparatus to which they are connected. They are patterned in some measure after the Lincoln demand wattmeter, having two opposed spirals of thermostatic metal, only one of which, however, is heated by means of current in the current-transformer circuit; the other serves for ambient temperature compensation. The typical logarithmic type of reading is obtained.

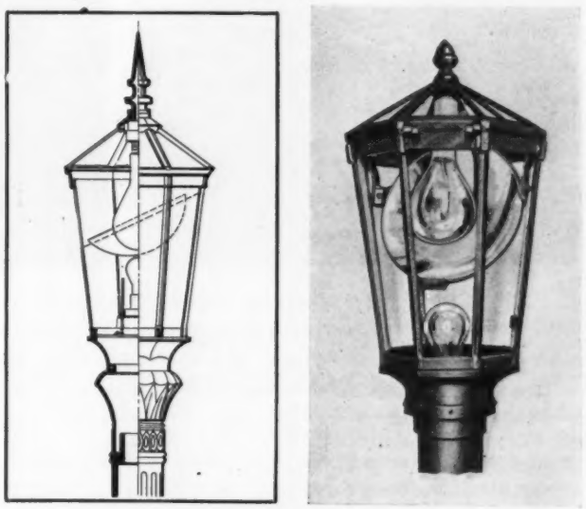
The general arrangement of supervised stations outlined above can now be considered standard on the Toronto Hydro-Electric System. It has been found adaptable to almost any site, is sufficiently flexible in operation and affords a high degree of insurance against trouble, in addition to being reasonably economical on a basis of first cost considerations.

Double-Purpose Lighting Standards

SIDEWALK lighting standards which also serve as floodlighting sources have recently been installed by the Public Service Electric & Gas Company, Newark, N. J. Older methods involved difficulties in placement of equipment in regard to location, concealment and maintenance. The new plan eliminates many objections and yields better results, according to W. T. Blackwell, general lighting representative for this utility. Several installations are illustrated in the frontispiece to this issue of Electrical World.

The new method makes use of an ornamental street lighting post with a standard octagonal paneled street lighting top, within which is concealed a floodlighting reflector and socket which is adjustable so as to permit the use of 500-, 750-, 1,000- or 1,500-watt lamps. The reflector is arranged so that it may be adjusted vertically, while any horizontal adjustment necessary is accomplished through rotating the lantern on the post. There is also a second socket which provides a secondary source of light to illuminate the lantern and to reduce the shadow effect caused by the floodlight reflector. A 200-watt lamp is commonly used for this purpose. The glass panels in the lantern on the side toward the building are of clear glass, while those toward the street and at right angles to the sidewalk are of light density glass, to reduce the brilliancy in these directions and to avoid interference with vehicular traffic.

The posts are located at the curb and are connected by means of laterals to the house circuits of the building



Two-unit lantern for combined lighting duties

The equipment of two manufacturers has been utilized in floodlighting of the modern type: Left, Westinghouse Electric & Manufacturing Company, right, Electric Service Supplies Company.

to be illuminated. Generally two circuits are extended to each post, one to supply the floodlighting and the other the auxiliary lamp. These may be controlled manually or placed on a time switch, as local conditions may indicate. Good results can be obtained using street lighting posts from 14 to 16 ft. in height. The spacing of the posts is dependent upon the width of the sidewalk. An empirical rule with the equipment now available is from two to two and one-half times the width of the sidewalk. Care is taken to locate the posts conventionally on either

side of the entrances of the building in order to get the correct architectural balance. This method can be used satisfactorily to illuminate buildings up to 75 ft. in height with a 15-ft. sidewalk. In order to avoid placing too many posts in front of a building, twin or triple tops may be used to advantage, according to Mr. Blackwell.

"A number of architects have expressed the opinion that they have been opposed to floodlighting previously because of its daylight appearance," states Mr. Blackwell, "but that this new method adapts itself architecturally to the building and therefore meets their specifications."

Chemically Treated Fir Poles Have Long Life

EXPERIMENTS with chemically treated Douglas fir poles show results on the system of the Portland (Ore.) Electric Power Company whereby it is believed a fir costing $2.10 laid down at the hole can be given 10 cents worth of chemical treatment which will increase its life from about four to more than fifteen years. This belief is based on the fact that the Molalla Electric Company, a subsidiary, has had fir poles in service for eighteen years which were treated with a mixture of bichloride of mercury, white arsenic and salt. After eighteen years poles so treated have been found sound at the ground line and free from insect attack and fungus growth.

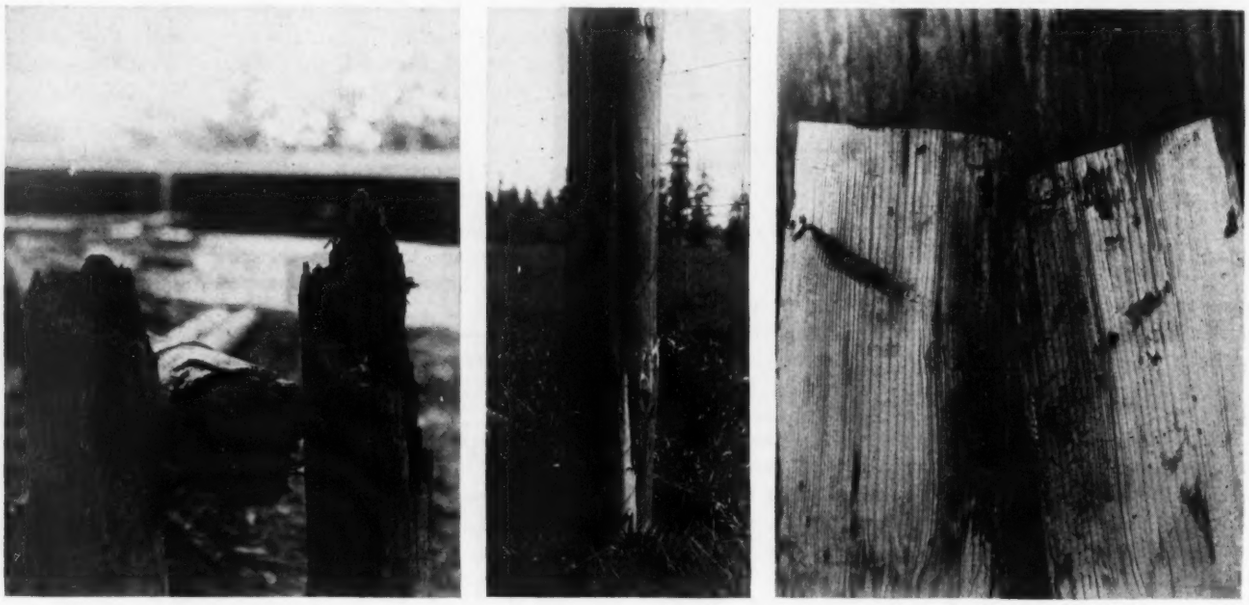
Present practice is to bore four ½-in. holes into the butt of the pole just above the ground line. One hole extends into the heart and the remainder are staggered around the circumference to lesser depths. Into these holes is placed a mixture of bichloride of mercury, one part; white arsenic, one part, and salt, four parts. The ingredients are mixed dry, by weight, and thoroughly blended. Only one treatment is given, after which the holes are plugged with corks.

Moisture from the earth and the sap in the pole gradually turns the mixture into a paste and it is said that within a few months it follows the grain of the wood and spreads over the entire circumference of the pole. White streaks show that it reaches to a height of 6 ft. above the ground. The wood appears to harden and when struck with a shovel blade is difficult to cut or dent. It repels insect attacks and the poison kills the fungus that induces decay. Poles treated in the spring with the sap rising are found to give best results. Dead or dry wood responds to the treatment least of all.

This poison treatment has been used by farmers of the district for many years and it is uncertain as to origin. Fir poles used for supporting vines in hop yards of the region are in use fifteen years after treatment. Originally the mixture was eight parts salt, but the electric company has doubled the poison content and varied the application by boring four holes instead of one.

Bichloride of mercury has long been known as a good wood preservative and effectively prevents decay for a long period, if thoroughly distributed through the wood. The salt, by attracting moisture, distributes the toxic material. It is doubtful if the arsenic is needed, but it is added merely as an additional germicide. The Forest Service has records of similar experiments in wood preservation dating back as far as 1870, but says that it has been used infrequently and has not been given scientific study. There is evidence that it was used even earlier in England and a patent was issued under the name "Kayanizing Process" for a similar process. This was in 1832. The chemical treatment costs 10 cents for mixture and 20 cents for labor and gives a $2.10 fir pole the same life as a cedar pole costing $5.86.

So far as is known the Molalla Electric Company is the only utility that has given the experiment a thorough study. It has adopted the method and considers it beyond the experimental stage. The accompanying illustrations afford evidence of the effectiveness of the treatment.



Treated and untreated Douglas fir poles after varying periods of service

Left—Stumps of three untreated fir poles after being in the ground four years, showing the action of decay and insects. Center—Fir pole treated at ground line with bichloride of mercury, one part; white arsenic, one part, and salt, four parts. After six years this pole was found to be entirely free from rot and insect attack. Right—Chemically treated fir pole after eighteen years of service, which was split and found to be sound as far as the chemicals penetrated. This pole was treated by filling a hole bored into the heartwood at the ground line with a chemical mixture half the strength of that now used.

Analysis Reduced Power Costs *in Clay Products Plant*

Capital investment and energy consumption minimized by engineering study of motor duties and process requirements in terra cotta mill

By Josiah L. Merrill
Consulting Engineer

PLANS for the complete electrification of the Perth Amboy (N. J.) plant of the New Jersey Terra Cotta Company were halted temporarily when it was found that primary supply, a transformer substation, distribution switchboard and new service connections would be required if the connected load was increased as contemplated. As a result of an engineering analysis of service requirements and motor sizes it was found possible to complete the electrification with a notable reduction in connected load and energy consumption over that previously estimated and to retain the existing 220-volt, three-phase, secondary service. The output of the plant is mainly terra cotta for building trimmings. A steam plant was previously used for the heavy power, clay grinding, mixing processes and for supplying compressed air. Electricity was purchased at 220 volts, three phase, for the blowers, fans, oil pumps for kilns and scattered machines. The electrical installation consisted of a total of 179 hp. in electric motors giving a connected load of 166.45 kva. at 220 volts, according to the ampere rating of the motors.

The substitution of electric drive for steam on the heavy-duty machines was decided upon, the first step being to change over everything except the air compressor. The original estimate required the addition of 225 hp. in motors. Of these, one 50-hp. motor was to be an 80 per cent power-factor synchronous machine; that is, 50 kva., so that the total added would be 216.33 kva. The transformer installation for the original 166.45 kva. consisted of three 50-kva. transformers and the power was purchased on the secondary side at 220 volts, three phase.

Primary Service Uneconomical

The addition of 216.33 kva. would have made a total installed capacity of 383 kva., requiring an estimated 450 kva. in transformers. This would have involved the purchase of power at 2,300 volts and a transformer substation inside the plant with a distribution switchboard and new service connections in order to meet the requirements of the supplying utility. When this was determined it was decided to have an engineering survey made of the plant to find out whether the proposed layout was necessary to take care of the increased service desired. The original motor list with the new motors added as a separate tabulation is shown in an accompanying table.

As the power company serving the plant had no power-factor penalty there was no strong inducement to correct power factor, unless the expense could be justified in the direct kilowatt-hour saving through line loss reduction, increased efficiency in the motor application or a sufficient reduction in the plant kilovolt-ampere load to eliminate the substation expense.

Since the existing plant demand was only 55 kw. and as, with the added load at the same load factor, the total plant demand should not exceed 120 kw. the 5 per cent reduction in the energy rate allowed by the supplying utility for primary current service would not cover the losses in the 450 kva. of transformer capacity. This would amount to not less than 6,500 kw.-hr. per month and at 2 cents per kilowatt-hour would equal $130 per month, while 5 per cent on a monthly bill of $1,000 would amount to only $50.

It should be noted that 126 hp. of the original plant installation of 179 hp. consisted of a fan and blower load

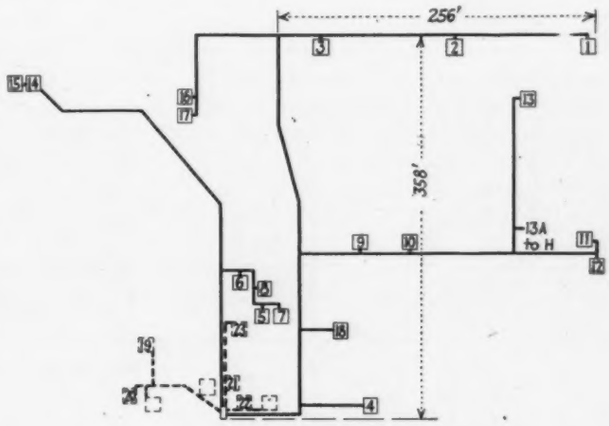


Fig. 1—Original plan of motor locations
Motors numbered 1 to 18 constitute installation before alterations, those shown in dotted lines 19 to 22 are new layout.

and only 53 hp. constituted a variable motor load. However, all of the added load was of the latter type, so that it could be expected that the load factor of the added load would be much lower than that of the original installation. The plant demand of 55 kw. on a connected load of 152.76 kw. indicated an over-motored condition, since 58 per cent of this power load should have a high operating load factor. Monthly use of electric service was as shown in the table on page 258.

Taking Feb. 18 as a characteristic day the average load from 7 a.m. to 6 p.m. (eleven hours) was 30.7 kw. or 337.7 kw.-hr. and, for the remaining thirteen hours of the 24, 22 kw. or 286 kw.-hr., making a total for the day of 723.7 kw.-hr. This was less than the average for December but more than that for November, which on a 29-day operation and a 14,388 kw.-hr. consumption at 100 per cent operation was 496 kw.-hr. per day. The diversity of operation reduced the apparent over-motoring, however. It will be noted from the accompanying table that motors 4, 7, 9, 10, 11, 12 and 13-A to H were operated at night only. Motor 16 was operated day and night and two of motors 1, 2 and 3 may be operated at the same time day

MONTHLY ENERGY REQUIREMENTS

	Actual Energy Consumption		Estimated Energy Consumption	
	Kw.-Hr.	Plant Operation, Per Cent	Plant Operation, Per Cent	Kw.-Hr.
Sept. 30, 1926	12,859	80	100	16,098
Oct. 30, 1926	9,339	68	100	15,565
Nov. 30, 1926	12,849	90	100	14,388
Dec. 29, 1926	17,399	100	100	17,399

In December, taking out the four Sundays and one holiday, the average is 725 kw.-hr. per day.

or night. The motors on the kiln blowers take 50 per cent of the power at the plant load factor. Assuming that all motors are operated at full load, the maximum possible load would be:

	Kilovolt-Amperes	Kilowatts	Reactive-Kilowatts
Day	110.05	103.33	60.4
Night	89.26	70.18	38.70

Taking into consideration the hours of operation of the various motors on a full-load basis, the monthly consumption would be 41,491 kw.-hr., of which motors 1, 2 and 3, or the kiln blower motors would be responsible for 20,501 kw.-hr. or 49.4 per cent. Taking the December consumption of 17,399 kw.-hr. the average motor load factor would be 42 per cent and that of November on a 100 per cent basis would be 34.68 per cent. Using the test day load, Fig. 2, the load factor would be 34.68 per cent and the five-minute peak reactive kilowatts of 55.16 checks rather closely with the motor tabulation of 60.4 r.-kw.

The average power factor of the plant during the test checks the load factor as being around 34 per cent. On account of this condition it was decided to go ahead with the new installation on the present service and transformer installation, testing each machine as installed to keep the motoring and kilovolt-amperes down as much as possible. A 15-hp., 1,200-r.p.m., three-phase, 220-volt double squirrel cage motor was tried on the sagger pan. It started the pan, but was thought light for some of the loads required and a 25-hp. motor of the same type and speed was substituted. The take-off conveyor for the sagger pan was driven by a 5-hp., 1,200-r.p.m. motor in the elevator tower, eliminating the line-shaft drive originally proposed from the sagger pan. This cut off 20 hp. connected capacity from the proposed installation.

Twenty-eight per Cent of Estimated Annealed Load Eliminated

The disintegrator had to be operated immediately and the 50-hp., 720-r.p.m. motor was connected up. It was found that the load was so light on it that it maintained a speed so near synchronism as to prevent the 400-lb. flywheel on the high-speed shaft of the disintegrator from taking the load surges it was designed to take and these were passed back to the power line. As it was impossible to get the proper high resistance rotor motor in the time thought necessary for this service the 30-hp. wound-rotor motor 14 was taken and used permanently on the resistance point necessary to give a motor speed drops that would allow the flywheel to do its work. This motor, 14, was replaced on its grinder by 10-hp. motor 5, which in turn was replaced by 5-hp. motor 8 and a ½-hp., 1,200-r.p.m. motor was purchased for the scroll saw, originally driven by motor 8. In this way a 50-hp. motor

Motor Installations in Clay Products Mill

Original List—220 Volts, Three Phase

Circuit	Motor No.	Hp.	R.p.m.	Type	Make	Amp.	Service	Full Load Kva.	Full Load Kw.	Full Load R.-Kw.	Hours per Month	Kw.-Hr. per Month
1	1	25	3,600	....	G. E.	59.2	Claridge fan	22.53	20.75	9.46	720	14,940
	2	25	3,600	....	G. E.	59.2	Claridge fan	22.53	20.75	9.46	134	3,781
	3	25	3,600	....	G. E.	59.2	Claridge fan	22.53	20.75	9.46	134	2,780
	*4	15	1,200	....	Lincoln	39	Blower	14.84	12.77	8.24	300	3,831
	16	3	1,160	KT	G. E.	8.35	Oil pump	3.16	2.62	1.78	730	1,922.6
	17	3	1,160	KT	G. E.	8.35	Oil pump	3.16	2.62	1.78	...	.....
	18	2	1,730	KT	G. E.	5.7	Oil pump	2.17	1.77	1.24	200	354
	8	5	1,730	....	Century	16	Scroll saw	6.09	4.52	4.23	175	791
	*9	3	1,140	....	Century	8.8	10 36-in. fans	3.35	2.73	2.55	300	819
	*10	2	1,200	KT	G. E.	5.7	5 36-in. fans	2.17	1.77	1.34	250	442.5
	*11	2	1,200	KT	G. E.	5.7	10 36-in. fans	2.17	5.31	1.34	300	531
	*12	2	1,200	KT	G. E.	5.7	10 36-in. fans	2.17	4.3	1.34	300	531
		110				280.9		106.87	94.59	52.22	3,515	29,713
	13	10	1,800	Single phase	Wagner	40	1 agitator 4 ball mills	12.14	8.50	8.50	250	2,125
	*13A-H	½	.....	Single phase	G. E.	24	8 36-in. G.W. fans	1.51	0.96	1.00	300	288
		11½				64		13.65	9.46	9.50	550	2,413
2	14	20	860	CW	W. E.	66	2 wheel grinders	28.6	25.17	13.6	200	5,034
	15	5	1,740	KT	G. E.	13	Blower grinder	4.95	4.29	2.19	200	858
	5	10	1,160	KT	G. E.	27	Joiner and band saw	10.27	8.46	4.56	220	1,861.2
	6	7½	870	....	W. E.	20.4	Elevator	7.61	6.50	5.38	50	325
	*7	5	1,750	KT	G. E.	12.7	Mold drier	4.83	4.29	2.19	300	1,287
		57½				139.1		56.26	48.71	27.92	970	9,365.2
		179						176.78	152.76	89.64	5,035	41,491
							New Motors				Hours per Day	
	19	50	720	KT	G. E.	125	Disintegrator	47.58			5	
	20	50	1,200	....	A.C.	125	Sagger pan	47.58			10	
	21	15	720	....	W. E.	40	Conveyor	15.22			5	
	22	60	870	KT	G. E.	147	Pug mill	55.95				
		175				437		166.33				
	23	50	1,200	Syn.	G. E.	125	Dry pan	50.00				
Grand totals		404				1,028		382.78				

*Motors operated at night only.

The characteristics of the motors were taken from their nameplate readings and the monthly hours of operation were estimated by the plant operators.

was taken out of the plant and a ½-hp. motor added, making a net connected saving of 48½ hp.

The 60-hp. motor on the pug mill was not changed, but a 1½-hp. motor was placed on the outer end of the pug mill take-off. The 50-hp. synchronous motor planned for the dry pan was replaced by a 25-hp. double squirrel cage motor and the 15-hp. conveyor motor by a 5-hp. and 2-hp. motor, thus taking a net 31½ hp. out of the plant. The 10-hp. motor 13 was replaced by a new 5-hp. double squirrel cage motor and the 15-hp. motor 4 by another 5-hp. motor of the same type, taking 15 hp. more out of the plant connected load. Therefore, altogether 116 hp. in connected motor load was directly eliminated from the original 404 hp. or 383 kva. thought necessary for the plant.

On account of the dusty conditions in the plant, the elimination of starting compensators for the motors offered advantages from the maintenance standpoint, and this possibility, coupled with the high starting torque feature, was a factor in deciding on the double squirrel cage type for the new motors purchased, all the motors being thrown directly on the line through magnetic switches operated by push-button control. Also on account of dusty conditions belts were eliminated in the drives as far as considered feasible, the large reductions to the very low-speed drives being made by a combination silent and roller chain or worm gear reductions. The belt drive was left on the disintegrator, but a gear reduction was installed on the sagger and dry pans.

The power contract under which service is received provides no penalty for reactive current, and the low losses due to short lines of heavy copper from the plant meter for the larger motors reduced the incentive to minimize this reactive current beyond that necessary for the motor excitation. It was found, however, that the installation of 2 kva. in static condensers on the 10-hp. motor on the two-wheel grinder materially improved its operation on peak loads and was justified on this account. The Claridge fans on the kilns are apparently greatly overmotored and are on the end of the longest lines in the plant. Their motors operate at 3,600 r.p.m., so that putting 3 kva. in static condenser capacity on their terminals for supplying a portion of the exciting current produces a line loss saving equivalent to that of remotoring and is better justified from the standpoint of investment and reserve capacity factors.

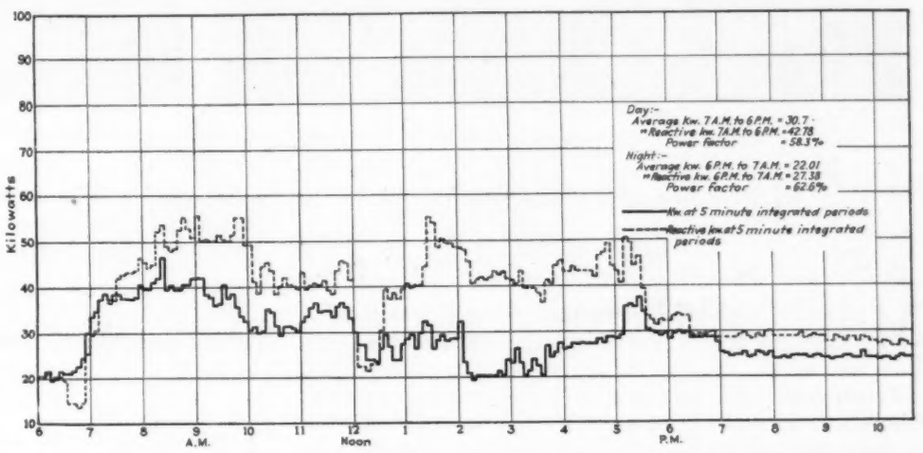

Kilowatts
Day:-
Average kw. 7 A.M. to 6 P.M. = 30.7
=Reactive kw. 7 A.M. to 6 P.M. =42.78
Power factor = 58.3%
Night:-
Average kw. 6 P.M. to 7 A.M. = 22.01
=Reactive kw. 6 P.M. to 7 A.M. = 27.38
Power factor = 62.8%
Kw. at 5 minute integrated periods
Reactive kw. at 5 minute integrated periods
A.M.
Noon
P.M.

Fig. 2—Plant-operation factors before alterations

This record for one day's operation presents values characteristic of a normal manufacturing day.

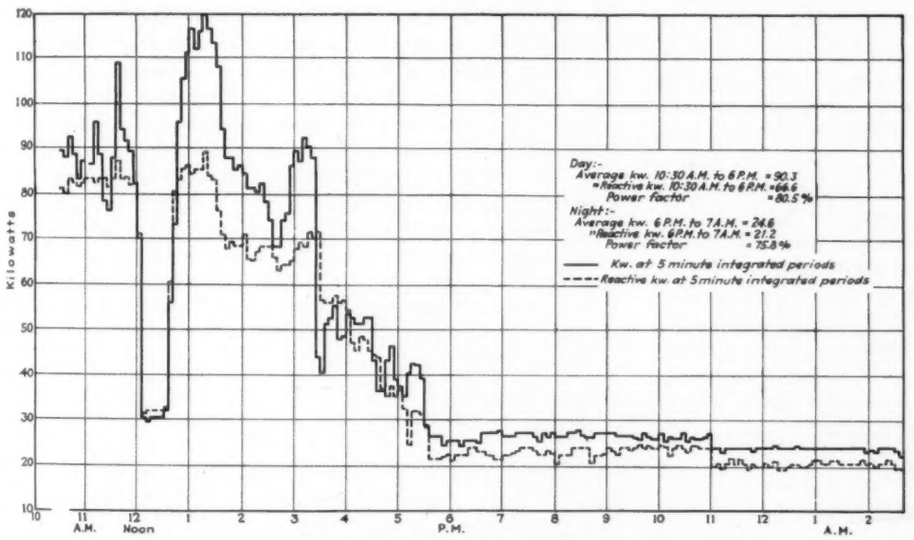

Kilowatts
Day:-
Average kw. 10:30 A.M. to 6 P.M. = 90.3
=Reactive kw. 10:30 A.M. to 6 P.M. =66.6
Power factor = 80.5%
Night:-
Average kw. 6 P.M. to 7 A.M. = 24.6
=Reactive kw. 6 P.M. to 7 A.M. = 21.2
Power factor = 75.8%
Kw. at 5 minute integrated periods
Reactive kw. at 5 minute integrated periods
A.M.
Noon
P.M.
A.M.

Fig. 3—Plant-operation factors after complete electrification

This record is for the day on which the peak load for November occurred.

The values of plant-operating factors for the peak-load day in the month of November are shown in the accompanying illustration. The consumption for the month was 28,240 kw.-hr. and the billed demand was 127 hp., or 94.74 kw. The average daily consumption being 941 kw.-hr., the consumption on Nov. 2, the peak-load day, adjusted for a 24-hour period, was 1,313 kw.-hr. The five-minute peak of this day was exactly 120 kw., which checks closely with the original plant analysis.

The engineering analysis of this plant eliminated 116 hp. from the original estimate of 404 connected horsepower. It established the possibility of purchasing secondary power, which in this case made a decided saving over buying primary power in spite of the 5 per cent discount for the latter. The elimination of compensators on the new motors eliminated the chief source of maintenance expense on the electrical equipment in a plant of this type. The plant curve after the changes were made shows a reduction of not less than 20,000 r.-kw.-hr. per month and 13,700 kw.-hr. over what would have been used if the revised installation had been completed as originally laid out, rather than according to the analysis recorded in this discussion.

Grouped motor-starting contactors and safety switches and compact dead-front board

Motor-Starting Facilities

By E. Woodbury
Electrical Engineer Stone & Webster, Inc., Los Angeles, Calif.

MODERN high-efficiency steam power plants require numerous auxiliaries which with hardly an exception are motor driven. The motors are usually for alternating-current operation and for starting directly across the line, readily permitting of push-button control in connection with magnetic motor-starting contactors.

The contactors may be located near the motors and placed on a convenient wall or column, as shown in the accompanying illustration. A fused safety switch is connected ahead of each contactor in the customary manner. The objection to an installation of this type is that considerable space is required.

A neat appearing and more compact motor control board for groups of motors has been developed for the new super-power steam plant of the Southern California Edison Company now under construction at Long Beach, Calif., by Stone & Webster, Inc. Such a dead-front motor-starting switchboard is shown in the right-hand illustration. A number of such boards are being installed in this plant. The development was the result of cooperation of the Diamond Electrical Manufacturing Company of Los Angeles with the writer.

Selecting Wire Sizes for Station Service*

By Max Kushlan
Boston, Mass.

THE calculation of wire sizes for motor leads generally involves a consideration of rating, type, voltage, efficiency, power factor, conditions of loading, length of leads, location of motor, etc. It is hardly practicable to assume a uniform set of wire sizes that would be suitable for all these variable conditions without sacrificing either reliability of operation or economy in copper. The best practice is, therefore, to determine first the maximum continuous current and voltage drop in the leads for any particular type of service to which the motor may be subjected and to choose the proper size of conductors and the thickness of insulation accordingly. (See article "Graphic Solution of Motor Circuits,"

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Suggested Conductor Sizes for A.-C. Motors Used in Station Service

	440-Volt, Three-Phase, Squirrel Cage							550-Volt, Three-Phase, Squirrel Cage							2,200-Volt, Squirrel Cage or Slip-Ring Prim.						
		N.E.C.		30 per Cent H. R.		V. C. or K.			N. E. C.		30 per Cent H. R.		V. C. or K.			N. E. C.		30 per Cent H. R.		V. C. or K.	
Hp. Full Load	Amp. Full Load	Conductor	Insul. (In.)	Conductor	Insul. (In.)	Conductor	Insul. (In.)	Amp. Full Load	Conductor	Insul. (In.)	Conductor	Insul. (In.)	Conductor	Insul. (In.)	Amp. Full Load	Conductor	Insul. (In.)	Conductor	Insul. (In.)	Conductor	Insul. (In.)
½	1.3	19/22	3/64	19/22	3/64	19/22	3/64	1.0	19/22	3/64	19/22	3/64	19/22	3/64	...	.....	....	.....	....	.....	....
1	1.7	19/22	3/64	19/22	3/64	19/22	3/64	1.3	19/22	3/64	19/22	3/64	19/22	3/64	...	.....	....	.....	....	.....	....
2	3.0	19/22	3/64	19/22	3/64	19/22	3/64	2.4	19/22	3/64	19/22	3/64	19/22	3/64	...	.....	....	.....	....	.....	....
3	4.5	19/22	3/64	19/22	3/64	19/22	3/64	4.0	19/22	3/64	19/22	3/64	19/22	3/64	...	.....	....	.....	....	.....	....
5	7.5	19/22	3/64	19/22	3/64	19/22	3/64	6.0	19/22	3/64	19/22	3/64	19/22	3/64	...	.....	....	.....	....	.....	....
7½	11.0	8	3/64	8	3/64	19/22	3/64	9.0	8	3/64	8	3/64	19/22	3/64	...	.....	....	.....	....	.....	....
10	14.0	8	3/64	8	3/64	8	3/64	11.0	8	3/64	8	3/64	8	3/64	...	.....	....	.....	....	.....	....
15	19	8	3/64	8	3/64	8	3/64	15	8	3/64	8	3/64	8	3/64	...	.....	....	.....	....	.....	....
20	26	6	3/64	6	3/64	8	3/64	21	6	3/64	6	3/64	8	3/64	...	.....	....	.....	....	.....	....
25	32	6	3/64	6	3/64	6	3/64	26	6	3/64	6	3/64	8	3/64	...	.....	....	.....	....	.....	....
30	39	6	3/64	6	3/64	6	3/64	31	6	3/64	6	3/64	6	3/64	...	.....	....	.....	....	.....	....
40	51	4	3/64	4	3/64	4	3/64	40	4	3/64	4	3/64	6	3/64	10	6	3/64	6	3/64	6	3/64
50	63	2	3/64	2	3/64	4	3/64	50	2	3/64	2	3/64	4	3/64	13	6	3/64	6	3/64	6	3/64
60	75	1/6	3/64	2	3/64	2	3/64	60	2	3/64	2	3/64	4	3/64	15	6	3/64	6	3/64	6	3/64
75	90	1/6	3/64	1/6	3/64	2	3/64	72	2	3/64	2	3/64	2	3/64	19	4	3/64	4	3/64	6	3/64
100	123	200M.	3/64	2/6	3/64	2/6	3/64	98	2/6	3/64	1/6	3/64	1/6	3/64	25	4	3/64	4	3/64	4	3/64
125	155	200M.	3/64	3/6	3/64	3/6	7/64	124	200M.	3/64	200M.	3/64	2/6	7/64	31	4	3/64	4	3/64	4	3/64
150	180	4/6	3/64	4/6	3/64	4/6	7/64	144	4/6	3/64	4/6	3/64	3/6	7/64	37	2	3/64	2	3/64	4	3/64
200	240	350M.	3/64	300M.	3/64	250M.	7/64	195	300M.	3/64	250M.	3/64	3/6	7/64	52	2	3/64	2	3/64	2	3/64
250	.....	.....	...	.....	...	.....	...	.....	.....	...	.....	...	.....	...	62	1/6	1/64	2	3/64	2	3/64
300	.....	.....	...	.....	...	.....	...	.....	.....	...	.....	...	.....	...	75	1/6	1/64	1/6	1/64	1/6	1/64
400	.....	.....	...	.....	...	.....	...	.....	.....	...	.....	...	.....	...	100	3/6	1/64	3/6	1/64	3/6	1/64
500	.....	.....	...	.....	...	.....	...	.....	.....	...	.....	...	.....	...	122	4/6	1/64	4/6	1/64	4/6	1/64
600	.....	.....	...	.....	...	.....	...	.....	.....	...	.....	...	.....	...	145	4/6	1/64	4/6	1/64	4/6	1/64
700	.....	.....	...	.....	...	.....	...	.....	.....	...	.....	...	.....	...	167	4/6	1/64	4/6	1/64	4/6	1/64
800	.....	.....	...	.....	...	.....	...	.....	.....	...	.....	...	.....	...	190	250M.	1/64	250M.	1/64	4/6	1/64
900	.....	.....	...	.....	...	.....	...	.....	.....	...	.....	...	.....	...	212	350M.	1/64	300M.	1/64	300M.	1/64
000	.....	.....	...	.....	...	.....	...	.....	.....	...	.....	...	.....	...	245	500M.	1/64	350M.	1/64	350M.	1/64

Legend:—M. = 1,000 circular-mils; N. E. C. = National Electrical Code rubber; H.R. = Hevea rubber; V.C. = Varnished cambric; K = Kerite; 1/6 = No. 0, B. & S.; 2/6 = No. 00, B. & S.; 4/6 = 0000, B. & S.

ELECTRICAL WORLD, March 26, 1927, by same author.)

In some special cases, however, where the application of the motor is strictly limited to a definite kind of service, the practical design of motor leads may be boiled down to a certain definite group of sizes which are found to be safe and economical in actual operation. The table of alternating-current motor leads given herewith is such an attempt to compute wire and cable sizes for motors used in driving the auxiliaries in steam or hydro-electric power stations.

The values given in the table refer to the feed wires from the starting device to the motor, assuming the voltage drop to be negligible. They are computed for circuits of 440 volts, 550 volts and 2,200 volts, three-phase, 60-cycle motors, as the most common types used for station service. In the case of the 2,200-volt motors, the cable sizes are figured for the primary circuits only, as the voltage and current in the secondary circuit of the wound-rotor type depend on the method of control and must be computed from data furnished by the manufacturers.

The sizes of the conductors and thickness of insulation given in the table are based on data compiled from actual design of five representative power stations now in operation. These values compare favorably with the National Electrical Code of 1928, with the slight variations introduced by an attempt to reduce the number of different wire sizes to a minimum, and by an increase in certain sizes to insure uninterrupted service in times of heavy overloads imposed on the station auxiliaries.

How Educator Views Utility Publicity*

Relates some experiences with utility representatives. His attitude on the information presented and suggestions for future relations

By MILTON C. POTTER
Superintendent of Public Schools, Milwaukee

Turn, turn, my wheel! All things must change
To something new, to something strange;
Nothing that is can pause or stay—

THUS, as recorded by Longfellow, sang the potter at his task, and every potter since in duty bound has tried to see and understand rather than to praise or blame.

In the year 1883 Clarence Dresser reported in the Chicago *Tribune* W. H. Vanderbilt's amused retort to repeated comments that public opinion was demanding reasons and information concerning the New York Central's recently installed extra fare or "luxury trains." Vanderbilt had exploded "Let the public be damned." The public responded by damning big business for a generation because of its failure to furnish news. The penalty paid on account of this haughty aloofness finally led to prompt and full publicity of corporate things done or plans in the making. So far did it go that the public began to gag on what some considered doctored news and now begins to reject a "public be crammed" attitude about as vigorously as it formerly resented a "public be damned" policy. The wheel turns.

At the time of the adoption of our present community civics your representatives felt that they had a right to complain at what they termed vicious attacks and unfair insinuations carried in that and other textbooks. They objected to the absence therefrom of reference to the rate-making powers of Wisconsin's Railroad Commission and public utility commissions in other states. They believed that alleged mis-statements and omissions were due to the Public Ownership League. Nothing could be done for five years concerning the Milwaukee texts, but I consented to serve in the meanwhile on a joint committee of school men and public utility men to investigate such charges.

So far as I knew your representatives' conduct was above censure, although quite futile. They had a perfect right to present facts as they saw them to authors. And authors had a perfect right to give them courteous consideration. The gratuitous assumption that all school book authors are foolish or crooked argues folly or worse in those who assume it. No change in our community civics occurred. What utility employees wrote their employers to prove they were earning their salaries I had no way of knowing. But the case is not closed and I am willing to meet them or read their communications as fully and freely as heretofore unless my own employers prohibit it. The same thing is true of labor unions, the Public Ownership League, or any others interested. The facts of government owned or privately owned utilities must be given courteous consideration. In the giant power battle, of which any Wisconsin activities are presumably merely a skirmish, school people are and must remain non-combatants. But they will honestly try to understand your statements, or your opponents' statements, as a guide to factual instruction, no matter what aspersions may result.

Chances for misunderstanding depending on the listener's state of mind are always with us. It is said that some Madison critics objected to your representatives deliberately *forcing* their files into the Washington testimony. They were undoubtedly right in furnishing every last scrap of correspondence and aiding the investigation in every way. But if they expected popular approval they must have been bitterly disappointed. Newspaper comment referred to those files as being *seized* by the government. Their statement that they

**Excerpts from address before Wisconsin Utilities Association.*

had no printed proceedings resulted in the caption "Secret files."

But why elaborate at this time? There are as yet no findings. Indeed, the testimony is not all in. Opinions are not facts. After all the heat and fury of prejudiced feeling Americans will be found still persistently, dispassionately, demanding the facts. Neither private power companies nor advocates of public ownership have permanently poisoned the public, however much or little they may have "corrupted school and newspaper men." If I were an interested advocate of private ownership I would trust the public. I would advocate a bulletin service and a public relations department irrefrangibly committed to find and tell the truth—to the public and to employers. And this I would do while fully conscious that the news it furnishes will likely be quite generally considered mere advertising propaganda.

Favors Presenting Both Sides of Controversies

The school problem resolves itself into a question as to whether children are to be taught the facts of the world about them, and if so by whom it shall be done. Whether commonly owned or in the hands of individuals associated together for the purpose of husbanding resources and underwriting risks over a period of years, the business of "utilities" is of prime interest. It is a matter of education that the young people shall know of their methods and aims through proper channels. This material must be furnished by the people who know most about it. To put it into instructional form is the function of the school people. But responsible and capable educational writers cannot be persuaded to undertake this work at the peril of their professional reputation for fairness, honesty and impartiality. School people occupy a middle ground. They realize the importance of these great service stations to the community's welfare, while greatly deploring selfish grabbing of resources or unfair use of power for selfish aggrandizement. Improper and untruthful advertisement of aims and methods would be bitterly resented, particularly if any portion of this material was designed for young people in the schools.

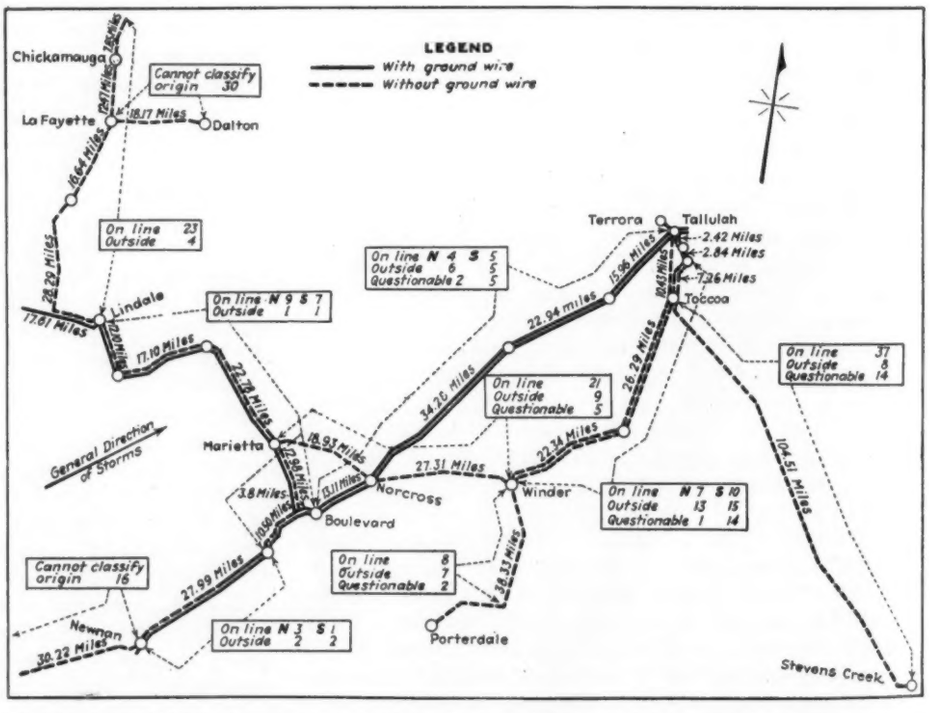
The public and semi-private production, management and conservation of these pieces of common property and their essential contributions to our common daily living are worthy of respect. It is unfair that the children of all the people may not know of their value and functions. But it is equally necessary that such organizations, chartered and protected by the state, shall be honestly acquired, conservatively managed, and regulated according to modern standards of economy and general usefulness. The young people should have the facts, should realize the demands of a highly organized society and should know how far the management of the utilities about them conforms to the voice of social conscience. Material we will have and increasingly. "To handle it so as to prevent children getting wrong notions" is our chief concern. To exclude it rigidly from the schools and from educational journals would certainly be to make sure of "children getting wrong notions." Mr. Crabtree, secretary of the National Education Association, indicates rather clearly the turning of the wheel:

> As a teacher I used to get advertising material put out by industrial agencies to add interest to geography and other subjects. We were able to get excellent help from the harvester companies, and from the cotton and silk manufacturers. We have often since then encouraged teachers to find material of this type to put life into the work of the school. It seemed to be one way of making contacts between the work of the schools and what is actually going on outside. Although certain organized business has seized upon this as a way of promoting selfish ends, I wonder whether it has after all been able to get very far in its designs. The high ideals of our profession would, it seems to me, enable the teacher as a rule to discriminate fairly well between that which is proper and wholesome and that which is not wise to teach.

There you hear the authentic voice of progressive education, "the new education," from the mouth of a middle-aged teacher. Freedom for teachers and children in selecting material is no new fad to him.

Teachers are the servants of all the people in a very intimate and delicate relation—the care of all your children. They should know and understand people. They will not come to understand any group by avoiding it or standing off and making faces. Eventually you and all Americans will more completely trust them just because they are *not* partisans. The wheel will turn. It always has turned.

Ground Wire Proves Protective Value in the South



THE reduction of outages on lines of the Georgia Power Company provided with ground wires and for those not so equipped, to a comparable basis of miles-per-outage-originating-on-line indicates a four-to-one ratio in favor of ground wire protection. As indicated in the accompanying illustration the number of disturbances have been classified according to whether the thunderstorms were manifested on the line, outside of it or were questionable in location.

Serving N. Y. Medical Center

Precautions taken to assure continuity of service. Some interesting electrical applications. Ultimate consumption estimated at 2,200,000 kw.-hr. annually

ELECTRIC service for the great Medical Center in New York City, which just recently opened its first six units, is furnished entirely by the United Electric Light & Power Company. This medical institution has the reputation of having the most extensive facilities in the world for teaching, research, general hospital treatment and clinics. It occupies 22 acres and comprises the following units:

1. Presbyterian General Hospital.
2. College of Physicians and Surgeons of Columbia University.
3. Harkness Private Patients' Pavilion.
4. The Sloane Hospital for Women.
5. The Squire Urological Clinic.
6. The Vanderbilt Clinic.
7. The Columbia Dental School.
8. The Babies' Hospital.
9. Presbyterian School for Nursing.
10. The Neurological Institute.
11. The New York State Psychiatric Institute.

One of the chief requirements of service, particularly to the central hospital group of buildings, is continuity of service. To meet this requirement arrangements were made to feed from several sources of power that would be relatively independent of one another. Up to the present time four distributing load centers have been planned with their ultimate feeder arrangements as follows:

Feeder Group No. 1.—Central Hospital and College Group.
One 13,800-volt feeder from Hell Gate generating station.
One 13,800-volt feeder from Sherman Creek generating station.
One 3,000-volt feeder from 146th Street substation.
Three 3,000-volt feeders from 187th Street substation.
Two 208-volt street ties connected with the United company's low-tension network.

Feeder Group No. 2.—School of Nursing.
One 3,000-volt feeder from 187th Street substation.
One 3,000-volt feeder from 146th Street substation.
One 208-volt street tie connected with the United company's low-tension network.

Feeder Group No. 3.—The New York State Psychiatric Hospital.
One 13,800-volt feeder from Hell Gate.
One 3,000-volt feeder from 187th Street substation.
One 208-volt street tie, connected with the United company's low-tension network.

Feeder Group No. 4—The Neurological Institute (under construction).
One 13,800-volt feeder from Hell Gate.
One 3,000-volt feeder from 187th Street substation.
One 208-volt street tie, connected with the United company's low-tension network.

One of the 13,800-volt feeders and one of the 3,000-volt feeders in groups No. 3 and No. 4 are different feeders than any in groups No. 1 and No. 2. This makes a total of six feeders serving the Medical Center as a whole. The failure of one or two sources of supply would not impair the quality of service with these varied facilities for service.

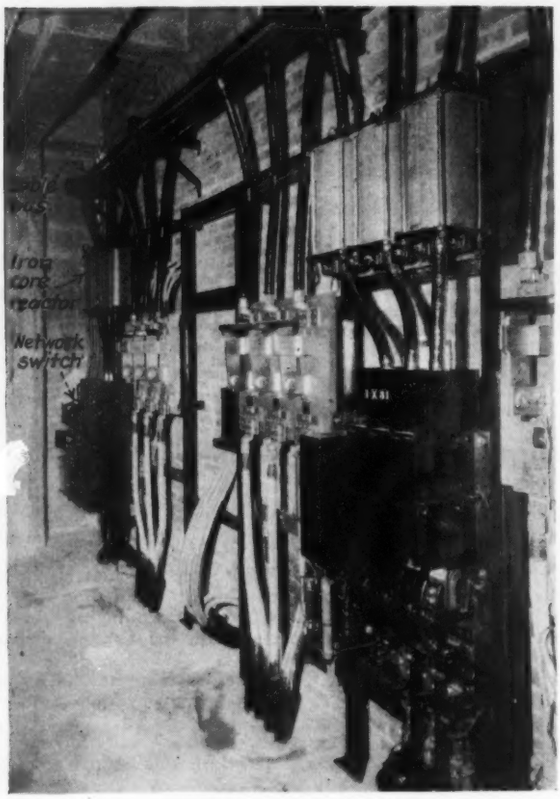
The utilization voltage for both light and power is 120/208 volts, three phase, four wire. One of the many advantages of alternating-current distribution is the fact that energy can be brought into the load centers at high voltages and transformed to service voltages. Each building represents a load center and has an individual primary point and distribution system, although there are secondary ties through the street system which furnish means at the various primary points of giving mutual support. With the exception of the metering equipment, all of the United company's installations are housed in well-ventilated fire-proof vaults near the customer's distribution centers.

Transformer banks in the central hospital and college group are rated at 300 kva. each and are tied on the secondary side through reactors and automatic network switches to a solid ring bus, which in turn is tied with the street grid by means of two secondary ties and with

the customer's main distribution bus and panels through six 1,000-amp. service switches.

The reactors, which are rated at 900 amp., 6.6 volts, are installed to reduce the possible circulating currents between the banks on different circuits and to secure better operation of the network switches. In case of a short circuit on the secondary bus or load side of the switches the reactors will tend to maintain sufficient voltage at the switches under secondary short-circuit conditions to prevent opening due to low voltage on the operating mechanism.

The network switches, which are fully automatic



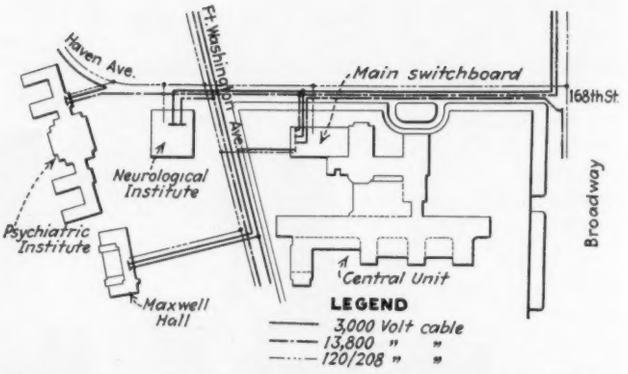
A switchroom showing cable bus, iron-core reactors and network switch

standard equipment, are used to separate the transformers from the secondary bus in case of faults in transformer banks or feeders, or in case the feeder is taken off at the station for inspection or cable work. When the feeder is put back on the system in normal condition to pick up load the network switches automatically close in and tie the secondary of the transformer to the secondary bus.

From the main switchboard in the central hospital and college group a cable bus passes through tunnels into all the buildings that make up the central group of the Medical Center. This bus is tapped at approximately twenty different points, and it is from these points that the vertical risers, each feeding its particular zone, start.

Variety of Elevator Equipment

More than 30 electric elevators, to say nothing of dumbwaiters and other means of transportation, will serve the buildings in the central group. At present there are 24 elevators in operation. These elevators have various speeds and capacities, depending on the purpose



Layout of 13,800, 3,000 and 120/208-volt feeders to Medical Center

for which they are used. All of them are provided with safety devices to protect the sick and employees against accident.

About one-third of the 30 elevators are of the high-speed, alternating-current to direct-current variable-voltage type, using alternating-current drive. These elevators will be used for visitors and those who want to make rapid trips up and down the skyscraper buildings.

Stretcher cases, in fact most of the patients, will be taken on the cars which are slower. These elevators are of two types, the alternating-current to direct-current variable voltage and the straight alternating-current.

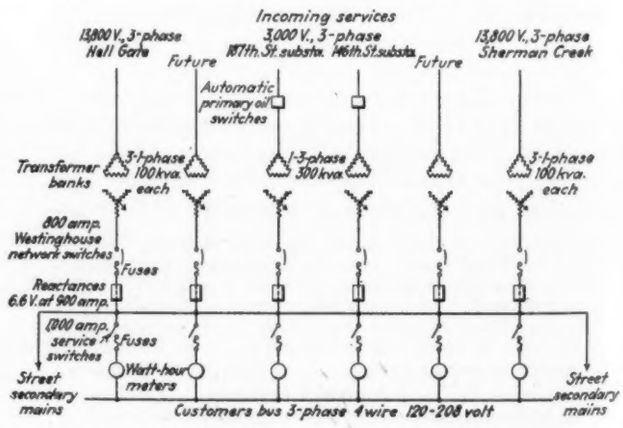
Sick-Room Lighting and Signal Systems

Illumination of the wards and sick rooms was very well solved by using fixtures containing two lamps of different ratings, thus providing means for varying the intensity of illumination as occasions may demand during the day or night. In the operating rooms scialytic fixtures were installed which emit a pure white light without any shadows or glare.

When a patient in a ward presses the nurse-call button, a blue lamp over the bed and a second lamp in the nurses' office are lighted. As there are three wards on a floor, signal lamps of three different colors are used in the nurses' office. Thus the floor nurses can tell from which ward the signal comes and, upon entering the ward, which of her patients needs attention.

In the case of private rooms, the signal lights are outside of each door instead of over the bed.

The doctors' call system involves a series of loud speakers distributed around the buildings and operated



Variety of feeds from different sources assure continuity of service

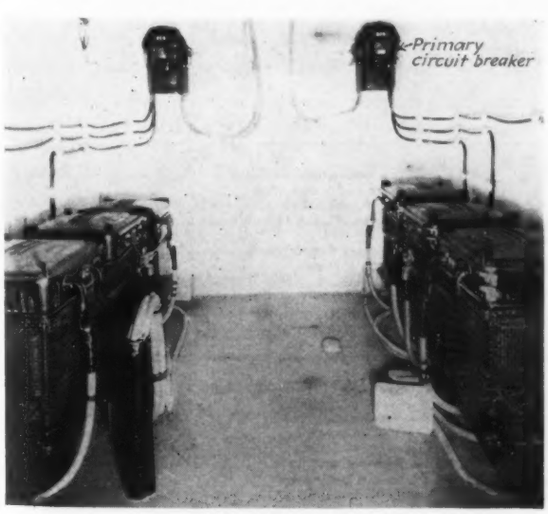
from the telephone switchboard. With this equipment a doctor can not only be paged but the message may be delivered. Used in conjunction with this call system are electric signals by means of which the doctors may indicate whether they are in or out of the building. When a doctor enters the Medical Center he pushes the "in" button beneath his name on a board in the doctors' dressing room. When he leaves he pushes the "out" button and so cancels the indication. One of the indicators is located in the information booth in the main lobby of the Presbyterian hospital and the other in the telephone switchboard room on the seventh floor. Thus, by the use of both of these systems, calls by phone or in person for the doctors can be handled with maximum efficiency and speed.

Due to the fact that there are four types of electrical service distributed through the buildings (two alternating-current circuits and two direct-current circuits) it became necessary to install convenience outlets which would prevent improper connection of any portable electrical appliance. When one considers the great number of portable appliances in a hospital of this size the need of the system mentioned will be appreciated. This is a completely new development and peculiar to the Medical Center.

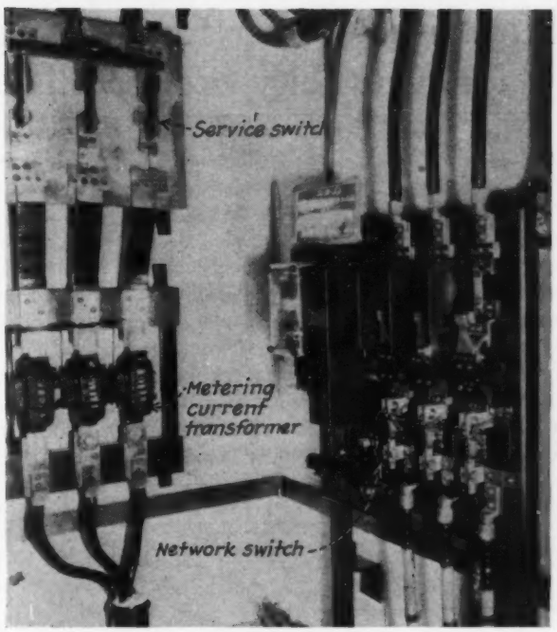
In addition to the preceding electrical features, the following general equipment has been installed: Twenty-two ventilating fans, totaling 400 hp., fourteen of which are driven by alternating-current motors and eight by variable-speed direct-current motors. Seventeen alternating-current pumps, totaling 625 hp. These pumps will be used for the hot water heating system, boiler feed water, hot and cold water supply and sump disposal. Ten motor-driven dumbwaiters, totaling 66 hp. These dumbwaiters will be used to carry the cooked foods from the main kitchen in the basement to the floors where they are served.

The kitchen will have 49 motor-driven kitchen appliances, totaling 80 hp., consisting of dish-washers, paring machines, ice crushers, ice cream freezers, meat choppers, etc. It is estimated that daily capacity of the main kitchen is 6,000 meals.

In the laundry there will be installed approximately 25 motor-driven machines, totaling 200 hp., consisting of clothes washers, extractors, mangles, pressing machines and tumblers. The capacity of the laundry is estimated at 10 tons of wash per day.



Transformer banks showing primary circuit breakers



Service and network switches and metering transformers

An estimate of the electrical consumption for the first five buildings is 1,400,000 kw.-hr. yearly, consisting of 1,200,000 kw.-hr. for the hospital and college and 200,000 kw.-hr. for the nurses' home. The estimated total consumption for the ultimate Medical Center will be 2,200,000 kw.-hr. annually.

Cost of Raising and Connecting Pole Type Transformers

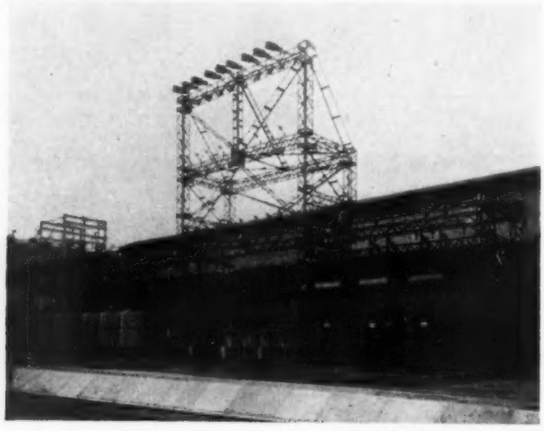
IN THE pending case of the Worcester (Mass.) Electric Light Company before the federal court at Boston in regard to rate base a tabulation of the cost of raising and connecting single-phase, 2,300-volt outdoor type transformers for pole service was presented by Stone & Webster, Inc., as estimated on the reproduction cost new basis. The estimate covers erection after delivery at the pole site and is segregated as to labor and trucking costs per day of eight hours. The company serves an area of about 35 square miles.

Crew	Rate per Hour	Total per Hour	Total per Eight-Hour Day
One subforeman	$1.25	$1.25	$10.00
Two linemen	1.125	2.25	18.00
Three groundmen	0.75	2.25	18.00
One material clerk, half time	0.55	0.275	2.20
Total		$6.025	$48.20
Insurance 5.96 per cent	.....	.....	2.87
One truck and driver	$1.80	$1.80	$14.40
Total truck and labor per day, exclusive of miscellaneous structural costs			$65.47

Kva. Capacity	Transformers Raised and Connected per Day	Cost per Transformer	Kva. Capacity	Transformers Raised and Connected per Day	Cost per Transformer
0.6	5.5	$11.90	10	3	21.82
1	5.5	11.90	15	2.4	27.28
1.5	5.5	11.90	20	2	32.74
2	5.5	11.90	25	1.8	36.37
2.5	5.5	11.90	30	1.5	43.65
3	5	13.09	37.5	1.3	50.36
4	5	13.09	40	1.3	50.36
5	4	16.37	50	1.1	59.52
7.5	3.5	18.71			

Purchased Power Exclusively for Kentucky Steel Mill

UTILITY-SUPPLIED energy is used exclusively in the operation of the American Rolling Mill Company's continuous sheet mill at Ashland, Ky., the electrical features of which were described in the ELECTRICAL WORLD of July 21, 1928, page 103. This company operates blast furnaces in connection with the mill and made a careful study of the possibility of using the blast furnace gas to operate a steam-generating station. Analysis showed, however, that such waste gas would supply only a small portion of the electric power requirements, and as a reliable source of central-station power was available it was decided to operate entirely from purchased power. Power is purchased from the Appalachian Electric Power Company, which operates a 40,000-kw. steam-turbine station at Kenova, about 13 miles from the Ashland plant, and which also has extensive interconnections with the other plants of the American Gas & Electric Company system. Power is received over two No. 4/0 and one No. 1/0 33,000-volt, 60-cycle circuits is carried on wood-pole lines and is stepped down to the consuming voltages of 6,600 and 2,200 in an 18,000-kva. transformer substation, located on the steel plant premises adjacent to the central power distribution station and jobbing mill motor run.



18,000-kva. transformer substation supplies steel mill load

Power is received over three 33,000-volt lines and stepped down to 2,300 volts in one 6,000-kva. bank and to 6,900 volts in two 6,000-kva. banks of transformers. The central power distribution station and jobbing mill motor room appears on the far side of the transformer substation.

The transformer substation contains ten duplicate 2,000-kva., single-phase, 33,000/6,900-2,300-volt, self-cooled transformers. Transformer secondaries are in three sections, which are connected in series for 6,900 volts or in parallel for 2,300 volts, so that the extra transformer serves as a spare for the six which are connected in two delta-delta banks for 6,900-volt service and for the three which are connected in a delta-delta bank for 2,300-volt service. All of the transformers are on wheeled bases, and a depressed track with transfer car runs in front of them, so that the spare transformer may be quickly substituted for a damaged one. High- and low-tension disconnecting switches are provided for each one so that a damaged transformer may be quickly cut out of the circuit and the remaining two operated in open delta in emergency.

The transformer secondaries are connected to buses in the central power distribution station, from which are run feeders to each of the several motor room substations in various parts of the plant. Truck-mounted oil circuit breakers are used on all of the main 2,300-volt and 6,900-volt circuits.

Transformers to step down the energy from 6,600 volts to 440 volts for the smaller auxiliary induction and synchronous motors are located at the various load centers about the plant in order to reduce the investment in distribution copper and to reduce line losses. Two banks of 1,000-kva. capacity each are located in the power distribution station, a third 1,000-kva. capacity bank is located in the blooming mill motor room and smaller banks are located at the river and reservoir pump houses and at the blast furnaces. Primaries of auxiliary power transformers are protected by manually controlled oil circuit breakers, while feeder circuits are controlled by reclosing circuit breakers, so that reliable 440-volt service is maintained with a minimum of attendance.

Motor-generator sets, except for a small one at the blast furnaces, are operated from the 6,600-volt system. A 500-kw., 250-volt set is provided at the blooming mill motor room to supply the heavy load of crane and blooming mill motors. Two additional 500-kw. sets in the power distribution station supply the bar and jobbing mill crane and auxiliary motors. In the newly completed cold strip mill motor room substation are two 1,000-kw., 250-volt sets to supply power for the five 600-hp. adjustable speed motors on the main rolls and for the crane and auxiliary motors in the sheet mill, cold roll and finishing departments. The direct-current buses in the three substations are connected by tie circuits of ample capacity, so that power may be interchanged, thus permitting equipment to be down for repair or inspection without delaying production. The 600-hp. motor controllers are connected directly to the cold strip mill station bus. Crane and auxiliary motor supply feeders are controlled by reclosing contactors, so that service is interrupted only in case of short circuit, and is restored immediately upon the clearing of the fault.

All 6,600, 2,200, 400 and 250-volt connections between the various substations are carried overhead on steel towers. At the substations connections are made to three-conductor cables which are carried into the stations in conduit. The accompanying tabulation shows the capacity of the supply source and the rating type of load on each class of service.

POWER SUPPLY AND LOAD—SUMMARY

1.	6,600-Volt Service		
	Supply	Two 6,000-kva. transformer banks	12,000 kva
	Load	Four induction motors	8,300 hp.
		Five synchronous motors on M. G. sets	5,029 hp.
		Six transformer banks for 440-volt power	4,275 kva.
2.	2,200-Volt Service		
	Supply	One 6,000-kva. transformer bank	6,000 kva.
	Load	Twenty induction motors	7,600 hp.
		One synchronous motor	225 hp.
		Six transformers for 110-volt lighting	437.5 kva.
		Two static condensers	840 kva.
3.	440-Volt Service		
	Supply	Six transformer banks	4,275 kva.
	Load	Three hundred and forty-one induction motors	6,557 hp.
		Four synchronous motors	1,115 hp.
		Six transformers for 110-volt lighting	150 kva.
4.	110-Volt Service		
	Supply	Twelve transformers	587.5 kva.
	Load	Lights, portable tools, etc.	.....
5.	250-Volt D. C. Service		
	Supply	Six motor-generator sets	3,575 kw.
	Load	Five 600-hp. main roll motors	3,000 hp.
		One hundred and forty-six crane motors	5,062 hp.
		One hundred and thirty-eight mill auxiliary motors	6,669 hp.
6.	600-Volt D. C. Service		
	Supply	One 2,000-kw. flywheel motor-generator set	2,000 kw.
	Load	One 2,500-hp. blooming mill motor	2,500 hp.

Contact with Shareholders*

No utility can afford to allow its public relations policy to overlook the importance of courting the good will of stockholders

THE modern conception of successful corporate management includes the practice of keeping shareholders informed of operating and financial results, progress, plans and policies of their companies. It seeks to build and maintain confidence, to promote friendly and mutually beneficial understanding between shareholder and corporation.

With the large growth of utility shareholders throughout the country during the past ten years the problems of shareholder contact have greatly increased. The customer-ownership movement alone has added probably 2,500,000 citizens to the stockholders' lists of the electric, gas, electric railway and telephone companies, a number increasing at possibly 350,000 or more a year. In addition are vast numbers of shareholders who have been attracted through the usual investment channels.

In the ten cardinal rules of customer ownership of the National Electric Light Association Rules 6 and 7 specifically enjoin the furnishing of information to shareholders. They read as follows:

6. The proprietary interest and responsibility of shareholders must be emphasized and the shareholders supplied regularly with information regarding the company and its affairs.

7. Loss of capital by shareholders in hazardous and fraudulent offerings from various sources must be guarded against by the rendering of authentic information and advice to shareholders.

It is interesting to note that in its 1928 report the customer-ownership committee of the National Electric Light Association presents and recommends a co-operative plan with the National Better Business Bureau for the purpose of conserving the resources of utility shareholders.

We are compelled to recognize the fact that determined and widespread efforts have been and are being made by advocates of government ownership to destroy the confidence of the general public in the electric light and power industry, including, of course, that of the shareholders. These efforts have been in progress a long time. Despite this fact there has been no loss of shareholders or slackening of the rate at which new shareholders are added. Neither has there occurred any perceptible manifestation of distrust as the result of the radical and political attacks on the utilities. In brief, it would seem that our companies fully possess the confidence of shareholders.

This confidence, we believe, is due in a large measure to the widely adopted practice by utility companies of freely issuing news and information regarding their business; of publishing comprehensive annual reports and year books; the regular issue of informative bulletins accompanying dividend checks, and a general policy of promptly meeting all specific requests from shareholders with complete information. Practically all of the companies with which our members are associated have been doing these things for years, and in substance such activities are much the same. In fact, so well known are these general practices that it hardly seems worth while to describe them in detail.

A number of companies in addition to printed publicity have encouraged well-attended annual stockholders' meetings and thus afforded direct contact through the personality of corporate officers and the spoken word. Radio broadcasting and motion pictures have been employed in some instances. Results have been accounted satisfactory.

> *". . . I am afraid that much of the splendid work accomplished by customer-ownership development will have been in vain if public utilities, as a whole, do not continue to use discretion in giving needless publicity to the great advantages of customer ownership and avoid constantly appealing to the shareholders to display more interest in the company."—Member of Committee on Contact with shareholders, Public Utilities Advertising Association.*

The subject of contact with shareholders has been given much consideration by corporations engaged in various kinds of enterprise. Growth of shareholders has been common to nearly all large corporations during the past ten years. Many manufacturing and industrial companies have developed and executed elaborate plans for conveying messages to their stockholders. While these efforts are by direct mail, for the most part, some attention has been given to publications advertising to reach shareholders, for example, General Motors Company.

The objectives of such contact are not confined to maintaining the investment confidence of the shareholder, but in addition to secure his co-operation in the further use and wider distribution of the company's products. Much advertising thought and effort have been expended by manufacturing corporations toward the latter end.

Utilities Lead in Building Confidence

It is probable that no other industry has given more thoughtful and effective care toward building up the small shareholder's interest and confidence than the utilities. Nearly all utility companies welcome the new customer-ownership shareholder with a friendly letter, requesting his personal interest and suggestions, and continually keep in mind, in bulletins, year books, etc., the desire to make each shareholder permanent. With the North American Company, and perhaps others, the effort even goes to the point of trying to learn why shareholders sell their stock, and if possible to retrieve the investor. We believe that considerable success has followed these carefully planned endeavors.

**From report by W. H. Hodge, chairman of the committee on contact with shareholders, presented at the annual convention of the Public Utilities Advertising Association.*

Your committee believes that the most matured thought should be given to all matters relating to shareholder contact, particularly with reference to the printed material issued. Certain considerations which should govern are expressed as follows by a member of this committee:

"In preparing material for stockholders, I try to keep two things in mind:

First—The stockholder has made an investment on the assumption that we will take good care of his money and pay him a satisfactory wage for it. He has the right to be offended if we do anything which has the appearance of making him a catspaw. From this viewpoint sales and political propaganda should not be hurled at him.

Second—On the other hand, every stockholder, large and small, is entitled to know what his company is doing and what its views are in matters which affect general economic conditions, and consequently may have a bearing on the value of his investment. He is entitled to information along these lines and we should endeavor to give it to him.

"Our company is brief and frank in publications prepared for stockholders. We have discussed certain topics having a direct bearing upon our company and its business, such as government ownership, taxes, the holding company idea and similar subjects. These discussions are not defensive in their nature, but straightforward statements which have a tendency to offset the plenteous propaganda emanating from those who do not share our views."

Another member of the committee says:

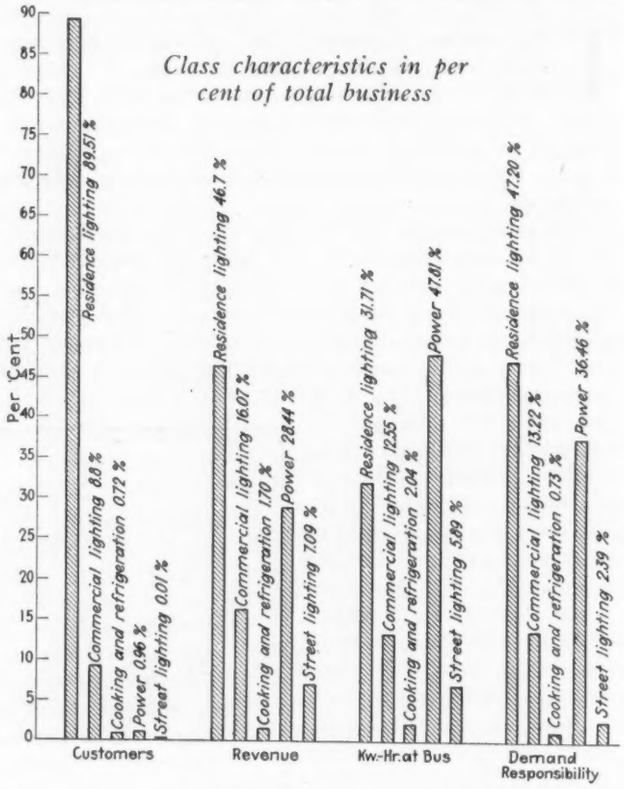
"From first-hand knowledge, acquired from talking to thousands of individual shareholders, I know these people selected our stock because they thought it was a good, safe investment which offered a satisfactory yield, and not because they had any interest in furnishing capital to enable our company to give better service at reasonable cost. After they purchased stock they became acquainted with executives and employees of the company through personal contact and in the course of time developed an actual interest in the company and its activities.

"Customer ownership in itself naturally cultivates an increasing interest in the company on the part of the shareholders. This interest can be stimulated by keeping the shareholders informed of the company's progress and rendering these shareholders the best possible service, but I am afraid that much of the splendid work accomplished by customer-ownership development will have been in vain if public utilities, as a whole, do not continue to use discretion in giving needless publicity to the great advantages of customer ownership and avoid constantly appealing to the shareholders to display more interest in the company."

Your committee wishes to emphasize its belief that the members of our association should continue to exercise restraint and judgment in planning, preparing and suggesting publicity material directed to shareholders of the public utility companies.

Cooking and Refrigeration Yield Best Return in Malden

A COST analysis of the Malden Electric Company's business and property for the year 1926 was prepared by Edward J. Cheney, consulting engineer, New York City, in connection with the pending rate case before the Massachusetts Department of Public Utilities, which showed that municipal street lighting yielded the lowest return (2.609 per cent) on the rate base, and electric cooking and refrigeration returned the highest yield (19.971 per cent). The Malden company serves a residential area north of Boston including many diversified manufacturing plants and is under the management of Charles H. Tenney & Company, Boston. The total rate base in 1926 was $8,848,756 and the average yield on the base 6.327 per cent. The average number of customers was 40,801, classified as follows: Residential, 36,525; commercial lighting, 3,589; cooking and refrigeration, 292; power, 390; street lighting, 5. The average revenue per kilowatt-hour sold was 9.35 cents for residential lighting, 8.06 cents for commercial lighting, 5.26 cents for cooking and refrigeration, 3.44 cents for power, 7.14 cents for street lighting and, for all business, 6.038 cents.



Allocation of Costs and Returns of Class Business, Malden Electric Company, Calendar Year, 1926

Present Value Rate Base (Cents Omitted)

Class of Service	Rate Base	Revenue	Operating Expenses and Taxes	Amount for Return	Per Cent Return	Kw.-Hr. Sales
Residence lighting	$4,454,278	$1,069,497	$838,735	$230,762	5.181	11,429,570
Commercial lighting	1,084,336	367,956	227,053	140,902	12.994	4,562,006
Cooking and refrigeration	82,047	38,951	22,565	16,385	19.971	741,127
Power	2,183,877	651,423	521,457	129,966	5.951	18,934,470
Street lighting	1,044,217	162,365	135,124	27,241	2.609	2,259,940
Totals	$8,848,755	$2,290,192	$1,744,934	$545,256	6.162	37,927,113
Adjustment for miscellaneous income				14,610		
Total available for return, surplus and contingencies				$559,866	6.327	

New Method of Machine Billing*

Mechanical "add-on" process of posting merchandise and other charges on electric service bills increases accuracy, improves appearance of statements and lowers cost

By L. M. LaPorte

Auditor Customers' Accounts Milwaukee Electric Railway & Light Company, Milwaukee, Wis.

Machine-billing department, where 200,000 customers' accounts are handled monthly

NEW and improved methods have been developed by the customers' accounts department of the Milwaukee Electric Railway & Light Company for mechanically posting or adding to the electric service bill all charges or credits for items or services received other than the current month's service charge. This utility, it is believed, is the first to devise a mechanical way of economically handling this work and at the same time render to its customers a better appearing and more intelligible bill.

In developing this posting process there were many requirements that were kept constantly in mind. The posting process must be so designed that it functions smoothly with the monthly scheduled flow of about 200,000 service bills to the customer on the regular date under extreme variations in merchandising activity. Completed bills must be made out in such a neat and businesslike manner as to command the customer's respect and recognition of the items thereon. Bills meeting these standards aid collections and reduce inquiries.

The process must function at the lowest possible unit costs, as the individual amounts handled are small. In many cases, lamp invoices and trouble service charges are for but fractions of a dollar, service arrears average less than two dollars and monthly installment billings on appliances vary from approximately one to ten dollars. As with service billing for residence customers, costs must be kept to a minimum if profitable operation is expected.

In order better to visualize the improvements that result from the mechanical posting methods, manual methods of operation will be briefly described. This entire posting process is called "add-on," because the items are added to the current service charge on the regular monthly bill and will so be referred to in this article.

Manual Add-on Method

The approximately 200,000 electric service accounts of the Milwaukee Electric Railway & Light Company, which utilizes stub accounting methods, are divided into routes corresponding to the meter registration books. About twenty of these routes, or approximately 10,000 service accounts, are assigned to each of the twenty bookkeepers.

Invoices for the various types of charges, as received from the merchandising divisions, are checked for name and location and routed to the bookkeepers' desks, where they are accumulated by electric service route. Just before the scheduled time of add-on, invoices are com-

**To work out this method of billing required a vast amount of investigation and study of its possible effect upon the different operations in the accounting department. Credit for the perfection of the system must be given alike to A. R. Carlson, assistant auditor customers' accounts; E. C. Wagner, supervisor of bookkeeping, and R. R. Hibbard, supervisor of machine bookkeeping, each of whom participated in the preparation of this article.*

pared with the meter registration book and the customer's account number is placed on each invoice. For each invoice covering the purchase of material on the deferred-payment plan the bookkeeper prepares an installment record card. This installment record shows the customer's name, address, account number, the invoice date and number, the name of the article, the purchase price, the amount of each installment and the date and amount to be added monthly on the electric service bill. It also shows payments received and the unpaid balance at all times.

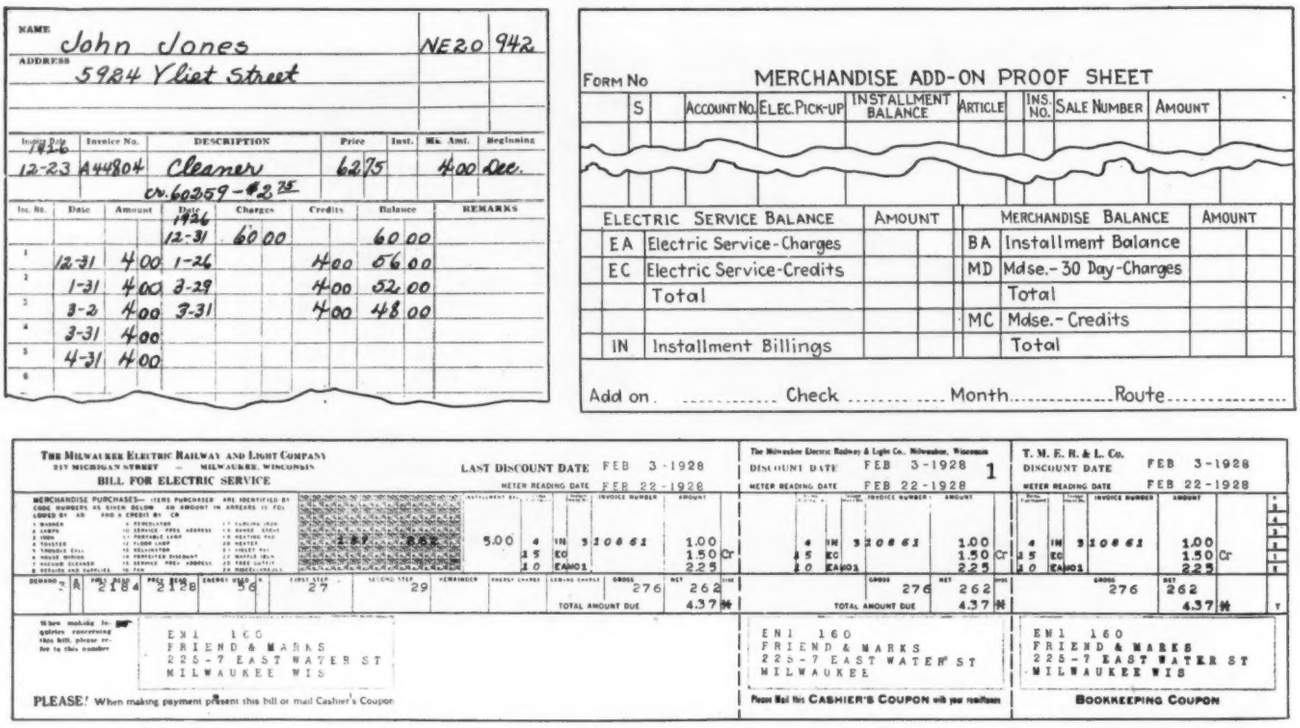
After the current month's service has been billed and verified, the electric service bills, by routes, are delivered to the bookkeepers for add-on. The bookkeeper arranges invoices and installment account cards in numerical order by account number.

All service or merchandise charges, other than installment accounts, are recorded on the filing stub, one stub for each month's charges. All such stubs remain in the bookkeeper's active file until paid. At the time of add-on all these unpaid stubs are removed from file for rebilling to the customer on the current month's electric service bill, as arrears. The sorted installment cards and new invoices, arrears stubs and current month's bills are arranged before the bookkeeper in three convenient groups: (1) Invoices and installment cards; (2) unpaid stubs, and (3) current-month service bills.

The bookkeeper examines her add-on material and determines the name and account number of her first add-on charge. For this she locates the corresponding service bill by turning up the other bills. To this she posts the charges, first to the customer's bill, then to the cashier's coupon and then to the filing coupon. Full references, such as item purchased, invoice number and installment number, must be entered so that the customer, or any other person examining the bill or either of its coupons, can readily identify the charges. Installment billings and arrears charges are not posted to the filing coupon, as the former are fully handled on the installment card and the latter already appear on the unpaid stubs. The postings continue as explained above and the bill is totaled on the customer's portion and the cashier's coupon. The filing coupon is not totaled as arrears and installments are not entered on it for reasons explained above. The completed bill is now turned over and the entire process repeated for each succeeding add-on in the route.

After the add-on for the entire route has been completed the work is given to another bookkeeper for verification. The second bookkeeper mentally repeats every operation of the original bookkeeper, thus verifying the work. Any bills in error must be made over and rechecked, as no bill can be sent out with an erasure or correction.

After final verification, bills are sent to a schedule clerk who registers the route and names of persons who did the work of add-on and verification. This is done so that strict responsibility for errors can be placed. Bills are then ready for delivering to the customers.


NAME John Jones
ADDRESS 5924 Vliet Street
NE20 942
Invoice No. DESCRIPTION Price Inst. Mo. Amt. Beginning
12-23 A44804 Cleaner 62.75 4.00 Dec.
cr. 60259 - $2.75
Inv. No. Date Amount Charges Credits Balance REMARKS
1926 12-31 60.00 60.00
12-31 4.00 1-26 4.00 56.00
1-31 4.00 2-29 4.00 52.00
2-2 4.00 3-31 4.00 48.00
3-31 4.00
4-31 4.00
Form No MERCHANDISE ADD-ON PROOF SHEET
S Account No. Elec. Pick-up Installment Balance Article Ins. No. Sale Number Amount
ELECTRIC SERVICE BALANCE Amount
EA Electric Service-Charges
EC Electric Service-Credits
Total
IN Installment Billings
MERCHANDISE BALANCE Amount
BA Installment Balance
MD Mdse.-30 Day-Charges
Total
MC Mdse.-Credits
Total
Add on ..... Check ..... Month ..... Route .....
THE MILWAUKEE ELECTRIC RAILWAY AND LIGHT COMPANY
231 MICHIGAN STREET — MILWAUKEE, WISCONSIN
BILL FOR ELECTRIC SERVICE
LAST DISCOUNT DATE FEB 3-1928
METER READING DATE FEB 22-1928
DISCOUNT DATE FEB 3-1928 1
METER READING DATE FEB 22-1928
T. M. E. R. & L. Co.
DISCOUNT DATE FEB 3-1928
METER READING DATE FEB 22-1928
5.00 4 15 10 IN EC EAM01 310861 1.00 1.50 Cr 2.25
DEMAND A 2184 2128 56 27 29 276 262 4.37 N
TOTAL AMOUNT DUE
EN1 160
FRIEND & MARKS
225-7 EAST WATER ST
MILWAUKEE WIS
PLEASE! When making payment present this bill or mail Cashier's Coupon
Please Mail this CASHIER'S COUPON with your remittance
BOOKKEEPING COUPON

Top, left—Installment record for deferred payment purchases. Top, right—Merchandise add-on proof sheet used in combined billing method. Below—New type of bill using code numbers for entering merchandise items

Development of the Process

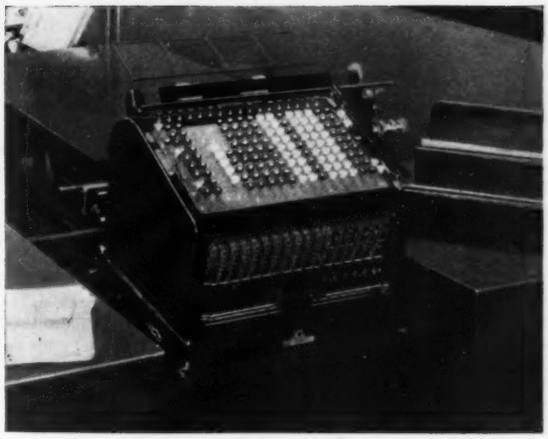
A tentative plan of operation was designed, in which every machine function for every possible add-on entry was outlined with the results wanted. This process was studied with representatives of the machine companies. These representatives, armed with factory data, computed how near to the tentative process a machine could be built.

From these analytical studies and conferences it developed that a better bill, better than any previously encountered, could be made. The problem then was to determine if this better bill could be produced at a lower

cost and the expenditure for mechanical equipment justified from an economic standpoint.

Machines with automatic repeat print features could make these repeat postings automatically, and during this time the operator could prepare for the next add-on item. This mechanical repeat print would make errors in repeat transcription impossible. Machines can add items mechanically as they are posted, without a separate addition process and eliminating the possibility of human errors in addition. Automatic repeat printing of items and totals with mechanical accuracy promised higher production rates with greater accuracy.

Mechanical equipment can classify items into desired groups, obtaining separate totals for each group independent of the items total obtained and placed on the individual bill. This ability indicated that control totals for balancing the route or customers' ledger could be obtained as a byproduct of the add-on operation and without additional cost, replacing hand listing for the balancing process, which was previously done as a separate operation.



Billing machine with especially developed keyboard for new method of billing

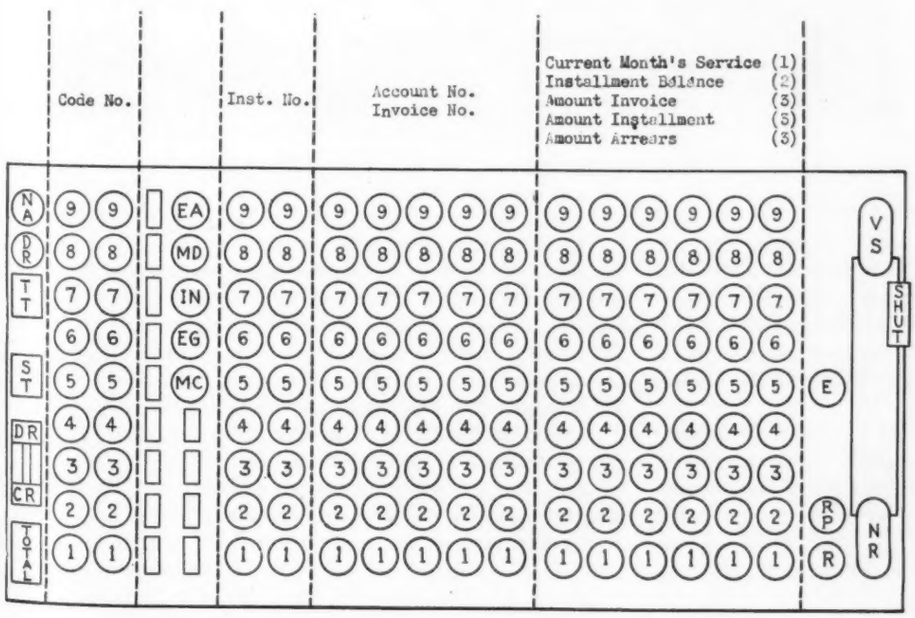
Experimental Machine

To test out the mechanical add-on, an old bookkeeping machine was changed so that it could be used, but it could not furnish a journal proof sheet or segregated totals. This machine within a few months was doing 45 per cent of the add-on work and proved that the principles were sound and that a better bill could be produced more economically by machine than with hand add-on. It proved that the add-on work could be done in about two-thirds of the time taken to do it by hand.

With the use of the experimental machine two changes in method were necessary to obtain the best results from machine operation. Under the manual add-on process, items sold are identified by name, generally hand entered, or checked on a listing. To print the add-on article name on the bill would require an add-on machine with some variation of a typewriter keyboard attached. Machines with such a keyboard all failed to meet the requirements and necessitated the use of code numbers for the designation of articles sold. This change was a logical one and one that has already been adopted by many firms. Monthly statements from a variety of business houses, ranging from furniture stores to oil refineries, showed that the plan was widely used and very feasible. A department store in Milwaukee uses code numbers on its monthly statements to amplify and explain in greater detail items that it would be difficult to identify from the article abbreviations used. The code number plan is simple, easily understood and so widely used that its adoption was justified. The use of code numbers can be seen on the new style bill.

The second change from present practice was to adopt the plan of posting to the customer's account, as a charge, forfeited discounts that are unpaid at the time of add-on.

Accounting practice varies on this; some utilities pick up forfeited discounts as an item of accounts receivable when billing and others carry these as memorandum billings until paid. The only objection offered to the plan of charging a customer with a forfeited discount before it is paid is that the charge must be reversed if the forfeited discount is later allowed. The experience is that this rarely occurs, as practically all allowed forfeited discounts are settled a few days after the expiration of the discount period and not twenty days later at add-on time. The advantage of posting the forfeited discount as a charge at the time of add-on is that this plan includes discount amounts in the route totals and permits a trial balance proof of the accuracy of posting. It also avoids an awkward machine set-up and operating cycle that must be used if gross service arrears are posted to customer's bill and cashier's coupon, and net service arrears and discount posted to bookkeeper's coupon. Clerical difficulties have not complicated the use of this equipment.



Keyboard arrangement permitting mechanical add-on

In brief, the operation of the special add-on machine is as follows:

1. The operator receives the route of service bills and the add-on items, both groups sorted in customer's account number order.

2. With the machine in the first position, the account number (banks 7 to 11 inclusive) and the current month's service charges (banks 1 to 6) are printed in the cross-hatched area, thus being concealed, but carboned through to the proof sheet.

3. In the second position, without vertical spacing, the actual installment balance is printed.

4. In position three, without vertical spacing, the first arrears or charge item is printed, entering the article code number (banks 16 to 18), symbol key (bank 14), installment number (banks 12 and 13), sale invoice number (banks 7 to 11), and amount (banks 1 to 6) as circumstances require. The item may be an installment billing, merchandise charge, merchandise credit, electric service arrears, or an electric service credit. Pressing the shuttle bar prints the data in position three, and automatically repeat-prints in positions four and five, returning to position three with one vertical spacing. Additional arrears items are inserted the same way.

5. When all charges or credits are posted the machine double spaces vertically and prints the total amount due, automatically repeating in positions four and five.

6. The items posted to the bill are transferred to six lower registers and there accumulated for trial balance proof.

The bookkeeper, taking the add-on journal proof sheet, subtracts the total of electric service credits (lower register No. 6), from the total of electric service arrears (lower register No. 5), and obtains the electric service arrears balance, which should check with the control ledger.

A similar check on the total merchandise amount outstanding can be made by computing the sum of installment balances outstanding (lower register No. 2) and of merchandise charge billings (lower register No. 4), less merchandise credits (lower register No. 1).

The new mechanical add-on process will economically produce more accurate bills of a better and more uniform appearance. Such bills, being a machine product, inspire in a customer greater confidence than a partly hand made bill. This confidence is deserved, for machine bills are under mechanical control that almost eliminates the possibility of errors. These bills have, as did manual add-on bills, the additional protection of careful inspection by a properly instructed personnel. The new method places a burden on machines that they should bear and leaves greater opportunity than before for human skill to function and give a better product than any previous product of the billing department.

In solving the add-on problem the question of improving the quality of the product was the first consideration, the potential economies involved being entirely secondary. Both questions have been solved, however, with notable satisfaction. The new method does the work at about three-fourths the cost of the old method, so in furnishing a better product the company is realizing savings of about 25 per cent of the previous costs for accomplishing the same work.

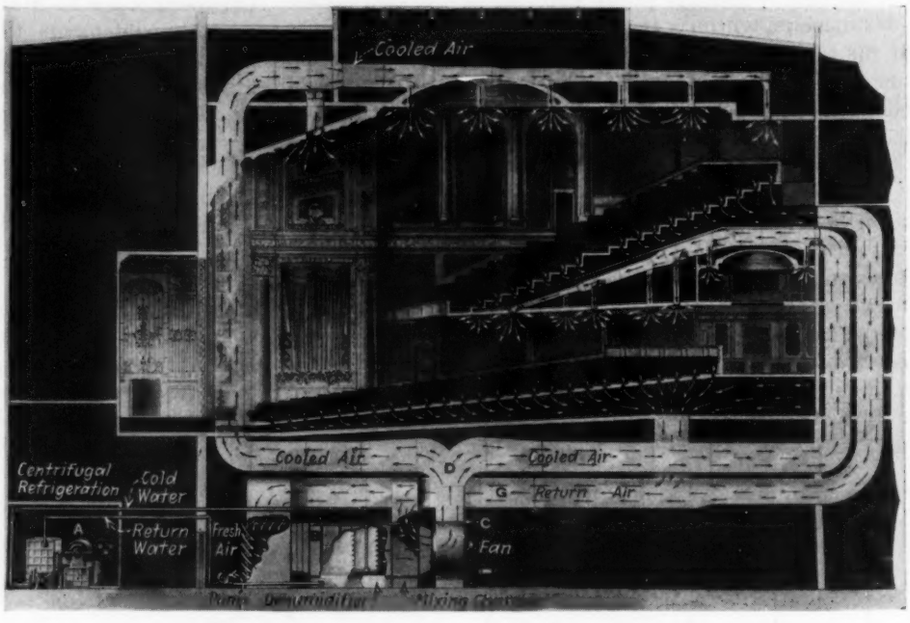
Finds Air Conditioning a Desirable Load

By A. D. McLay

Sales Engineer Detroit Edison Company, Detroit, Mich.

MECHANICAL production of fine weather or air conditioning which makes for the health and comfort of people in large buildings is the source of a desirable and profitable load for many power companies. The process, which is a refinement of the cooling and ventilating system, consists of freeing the air from dust and foreign gases by washing and then properly combining and regulating its movement, temperature and humidity.

Installations of air-conditioning systems are being made in theaters, department stores, hotel lobbies and dining rooms, restaurants and office buildings. Even a few residences have complete air conditioning and hundreds are adding humidity by evaporating water with electric heat. Large theaters are commencing to be considered obsolete without air-conditioning equipment. When one department store makes its own pleasant cool weather its competitors must do likewise. Thus the load is growing and its acceleration will be rapid.



General layout of air-conditioning system for theater cooling

By far the largest power-consuming element in an air-conditioning system is the refrigerating unit, and consequently the largest load is during the hot weather. The fans and spray pumps are, of course, in use all the year. At present there is being installed in office buildings and theaters in Detroit air-conditioning machinery having 3,450 tons of refrigeration and 6,200 hp. in motors.

Several of the larger downtown theaters have had complete air conditioning for a number of years. The cost of this for a theater averages $15,000 to $18,000 per thousand seats. The operating cost, including power, water and attendants, is quite an item, but the cost per patron is low, and when, as actually happens on hot evenings, people commence to crowd the theaters rather than the parks and bathing beaches the cost is more than offset by the increased patronage.

The power demand in theaters during the hot months is about 65 kw. per thousand seats and the energy consumption averaged over four months of summer operation is about 450 kw.-hr. per 1,000 seats per day. Inasmuch as the total seats are sometimes sold two to three times per day, this means that for 1 cent several patrons can be kept cool and comfortable.

Too much humidity is also objectionable, especially during the hot, "muggy" days of summer. The right amount for comfort is 55 per cent to 65 per cent of what the air can hold at the given temperature, and with this we feel refreshed and alert.

Some idea of the load for air conditioning may be had from knowing that a large department store will have 1,300 tons of refrigeration; all floors, of course, will not have conditioned weather. An office building covering half a city block and 25 stories high has fourteen floors conditioned and will have 600 tons of refrigeration. The average large theater has around 400 tons. These machines require about 1.8 hp. in motors per ton of capacity, so it is evident that as the use of home-made weather spreads the motor load will grow accordingly.

Secure Specific Selling Data

CONVINCED of the revenue-building possibilities from developing industrial applications of electric heat, some utility companies have analyzed their market possibilities and secured data that will make unnecessary the shotgun sales methods sometimes used. For example, the Consolidated Gas, Electric Light & Power Company of Baltimore, starting with its high-tension customers, has studied the individual processes which require heat in any form. Having ascertained the advantages or disadvantages of existing methods, it has classified them as excellent, good, or (at present) remotely possible applications for electric heat. With this information the new-business department has been able to determine the applications on which it will concentrate sales attention, and also where the salesmen can find these applications. Furthermore, being acquainted with definite experiences with existing methods, the salesmen know what advantages must be shown for electric heat. The Duquesne Light Company and, probably, other companies have similarly analyzed their markets.

Industrial Progress Rapidly Accelerating

"The pace of industrial progress is accelerating yearly to such an extent that I expect to see in industry in the next twenty years more advance than in the last 50. This is almost an industrial revelation. It means the prosperity of the country and can have only a beneficial effect on every one of us as consumers. You sometimes read that new machines are bad for the workingman. In reality, the machine is his opportunity to produce more and better work.

"The standards of twenty years ago do not go today. People are very critical, and it is up to us to watch more carefully than ever before to see that the product we turn out is approximately what we ourselves would want to get."—*From an address to employees of the Simplex Wire & Cable Company, Boston, by President Everett Morss.*

Letters from Our Readers

Range-Selling Experience in a Small City

To the Editor of the ELECTRICAL WORLD:

I am interested very much in your July 7 editorial on high cost of wiring for ranges. Even in a small community like this we have felt the problem and wondered what is the matter. For several years we have pushed electric ranges and with a population of 10,000 and about 2,000 homes we have developed the use of around 200 ranges. Our rate is 3½ cents to 4 cents. We sell ranges at list and even shade this price sometimes to get the business. We charge $25 for wiring, which is about the cost and sometimes below. We have one salesman, sometimes two, and use any or all help manufacturers offer, including newspaper, pamphlet and movie-slide advertising.

As indicated, about 10 per cent of the homes use electric ranges. Is this low, fair or about all we are to expect?

I lean to your third reason for present conditions: "High price compared with gas range." Our discounts are such that we can clear "net" only 8 per cent after deducting costs, commissions, overhead, etc. To illustrate, one model of a well-known electric range, with a "shipping weight" of 255 lb., sells for $151.85 plus $25, or $176.85 installed, ready to use, or at 68 cents a pound. Henry Ford delivers his ware to your door, ready to use, at 30 cents a pound.

Apparently there are too many range manufacturers, they charge us too much, or they have not adopted the efficient methods of Henry. Considerably more machine work, parts, etc., are involved in an auto than in the sheet steel assembly of a range. Therefore, if the range was down to 30 cents a pound, it would reduce the price about $70, which is a bigger saving than could be obtained by trying to cut the wiring cost in two.

Now as to selling, we notice that probably 70 per cent of our citizens are renters. Of course, they will not pay for wiring. The owners, we find, are not enthused, because they claim they do not make more than 5 per cent, if that, on their investment. Consequently they hesitate to wire up, although we tried to show that an electric-range-equipped house attracts tenants more readily. We only have one case where we succeeded in inducing the landlord to install two ranges in his duplex, as it will save redecorating required by smoke, etc. If owners can be sold this idea, then an increase in sales can be looked for.

I believe that such queries as outlined in your editorial will bring out the reason for the inadequate introduction of a valuable domestic application of electricity. When we know the reason we can apply the remedy.

W. B. VOTH,
Manager.

Watertown Public Service Company,
Watertown, S. D.

Digest of Electrical Literature

Hydro-Electric Development and Steam Equipment

Higher Steam Pressures and Temperatures.—Economy data from ten representative high pressure and temperature power plants indicate a realization of theoretical gains from higher pressures and temperatures. Heat consumption rate of these stations, supported by detailed data reconciling actual with calculated results, offer an ultimate proof of the value of extended steam conditions. Higher pressures do not decrease turbine efficiency, for one company reports a large reheat, condensing machine having 80.5 per cent efficiency ratio, while another reports a small high-pressure unit expanding superheated steam from 1,200 lb. to 300 lb at 80 per cent efficiency. Water rate curves show high-pressure machines to have exceedingly flat characteristics, furnishing a reason why the value of high pressures is not confined necessarily to base-load plants. Experience with plants operating at 600 lb. and over shows a justification for higher rates of steaming per square foot of steam-releasing surface over lower pressure practice. Steam carrying capacity of tubes is greatly increased by the decreased volume of high-pressure steam and accurate comprehensive moisture tests have shown a maximum of one-third of one per cent moisture in the steam from a 1,300-lb. boiler operating at 300 per cent rating. Operating experiences have been thoroughly summarized.—*Serial Report National Electric Light Association,* June, 1928.

Pulverized Lignite Experiments.—R. L. SOUTHERLAND, N. T. BOURKE and E. J. O'KEEFE.—Experiments in the utilization of pulverized lignite have been carried on at the University of North Dakota for some time and the results of recent tests are reported in this article. The authors have outlined the arrangement of the test equipment and have listed the items utilized for this purpose. The results obtained, while not definitely conclusive, have been offered as indications of results which may be anticipated under adaptation of this method of fuel combustion.—*Power,* June 26, 1928.

Transmission, Substations and Distribution

Short-time Current Carrying Capacity of Copper Wire.—E. R. STAUFFACHER.—The ability of copper wire to withstand heavy currents for short periods of time, varying in length from a fraction of a second to a few seconds, has been studied and results are given in this article. The determinations obtained as a result of this investigation have been charted and certain formulas derived for the expression of the indicated results.—*General Electric Review,* June, 1928.

Operation and Maintenance of Rocky Mountain Transmission Line.—V. M. MCDONALD.—A discussion of the difficulties incident to maintaining service on the 110-kv. Shoshone-Denver transmission line in Colorado. This line crosses the Rocky Mountains three times at heights ranging from 11,500 to 13,700 ft. It is subjected to a minimum temperature of minus 62 deg. F., wind velocities of 165 miles an hour, snowstorms and slides and a summer lightning period of great intensity. The features of design, control and maintenance, scheduling and protective equipment have been covered. A summary of interruptions covering a period of sixteen years and classifying the various types of operating difficulties is also presented.—*Electrical West,* June 1, 1928.

High-Voltage Underground Cables.—R. APT.—The article gives a general survey of latest achievements in the electric design and modern manufacture of single and triple conductor cables, in particular those with metallized covering of the individual strands. The greatly increased safety and immunity from atmospheric disturbances of underground cables as compared with overhead lines offers a strong inducement for designers and manufacturers to build safe cables for high voltages. At present no difficulties are encountered with three-phase cables up to 60 kv. and single-conductor cables for 100 kv., although there are short lengths of more or less experimental cables in operation at 132 kv. To insure permanent safety, safety of operation, the cable design should be such as to keep dielectric losses proportional to less than the square of the operating voltage. The potential at which the losses begin to rise faster than the square of the voltage is called ionization voltage, and should not, it is said, be less than 14 kv. for a 10-kv. cable.—*Zeitschrift des Vereines Deutscher Ingenieure,* June 16, 1928.

Improved Primary Distribution.—J. G. JACKSON.—A plan whereby all primary feeders may be placed in lead-covered cables of such size as considerably to exceed the current carrying capacity required for the individual feeders, to sectionalize feeders, preferably at transformer location, and to arrange adjacent feeders so that through sectionalizing points each pair of two feeders will form a loop back to the same station bus, the sectionalizing connections being open normally at the points dividing the two feeders thus linked up, has been offered by the author in an endeavor to improve primary distribution. This loop system is stated to be capable of use with a group of three feeders and with alternative connections to one or other of the two. It is anticipated that increased safety to the linemen and to the public, with less interruption to service during storms and sleet conditions, and without involving an excessive cost, may be secured. Improved regulation and a reduction in copper losses which, taken together with reduced maintenance costs, will fully justify the investment required to carry out the plan are pointed out.—*Electrical News (Canada),* June 15, 1928.

Generation, Control, Switching and Protection

Blading Metals in Modern Steam Turbines.—ALBERT BODNER.—The problem of turbine blading metals, which is continually occupying the attention of metallurgists and engineers, is discussed in this article. The author, as the result of varied and extensive experience, draws the conclusion that non-oxidizable steels alloyed with a high percentage of nickel and chromium, and not dependent on surface polish or heat treatment for their corrosion-resisting properties, can be used satisfactorily in the high-pressure stages of modern turbines where extremely high temperatures prevail. Microscopic examination of specimens that have failed in service are presented and the thermodynamic considerations affecting the corrosion of the metal have been developed.—*World Power (England),* July, 1928.

Units, Measurements and Instruments

High-Speed Recorder.—C. I. HALL.—A new electrical instrument for automatically recording variations of electrical functions at high speed has been developed by the author. The rate of chart motion is lower than that of the oscillograph, so that the envelope of an alternating-current wave is produced. This recorder has been successfully applied in the analysis of breakdowns on transmission lines giving data used as the basis of securing improved selective relay protection and for other problems involving automatic and high speed recording. The design and operating characteristics of this device as well as the several applications which may be profitably applied have been covered.—*Journal of the American Institute of Electrical Engineers,* July, 1928.

High-Frequency Measurements of Communication Lines.—H. A. AFFEL and J. T. O'LEARY.—A brief description of the testing technique developed for making line measurements at high frequencies in connection with the application of carrier telephone and telegraph systems. The measurement of

line attenuation, impedance and cross-talk up to frequencies as high as 50,000 cycles is described, using a number of specially developed and standardized high-frequency apparatus units. These include an oscillator, a detector-amplifier, an impedance bridge, a thermo-milliammeter set, a variable attenuator, a cross-talk set and a frequency meter. A brief description of the individual units is given, as is the general plan of co-ordinating their use in the complete testing of circuits.—*Reprint B-317 Bell Telephone Laboratories, Inc.*

Motors and Control

Slow-Speed Versus High-Speed Motors.—B. A. BRIGGS.—A comparison of the power factor, efficiency, cost, starting torque, starting equipment and maintenance of slow-speed motors directly connected to the load with high-speed motors connected by a speed reducer has been made by the author. Specific installations and performance curves have been added to the discussion and certain general recommendations made regarding installational advantages and service duties.—*Power,* July 10, 1928.

Electrophysics, Electrochemistry and Batteries

The Fermi-Dirac Hypothesis of Gas Degeneration and Its Applications.—E. S. BIELER.—A large number of applications of the theory of the exclusion principle, stating that in any given atom there cannot be two electrons possessing the same combination of the four quantum numbers, have been cited by the author as substantiating the fundamental concepts of this theory. The extension of the contention of Pauli by Fermi and Dirac to the realm of gases, problems and research has been followed by the author with some general considerations of the quantum theory, the applications of the electron theory of metals and enumeration of some outstanding problems.—*Journal Franklin Institute,* July, 1928.

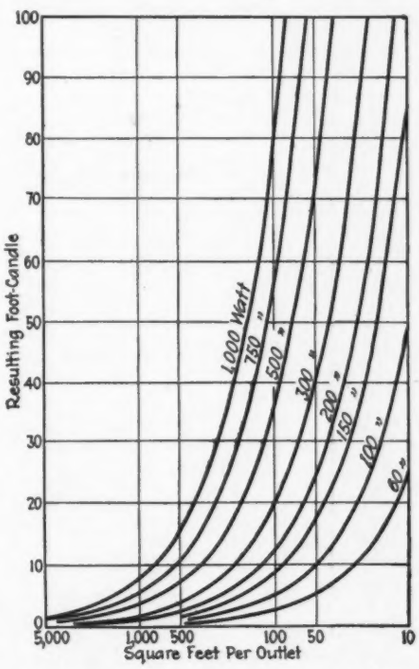
Recent Progress in the Theory of Band Spectra.—EDWIN C. KEMBLE.—Recent progress in the application of wave or quantum mechanics to the problem of band spectra and molecular spectra has, according to the author, been so great that it seems not improbable that within a few years the fundamental principles of molecular formation may be understood as definitely as the more customary problems in elementary electrical machinery design are now understood. Present knowledge on this subject has been reviewed by the author, the findings of several contemporary investigators reported and the probable trend in future progress pointed out.—*Journal of the Franklin Institute,* July, 1928.

The Photoelectric Cell.—L. R. KOLLER.—A statement of the underlying principles and the fundamental problems of the photoelectric cell precede an exposition of the operating characteristics and sensitivities obtainable with different alkali metal materials used in the construction of these devices. An indication of the potential applications is also offered.—*General Electric Review,* July, 1928.

Illumination

Principles of Street Lighting.—A committee report of the I.E.S. which advocates certain principles of street lighting based upon services promoting safety and convenience, enhancing the community value of the streets and increasing the attractiveness of the streets. A number of principles, subdivided according to street conditions, visibility, appearance, economics, criteria and measurement, have been offered.—*Transactions of the Illuminating Engineering Society,* July, 1928.

Industrial Lighting Systems.—A. W. KAKILTY.—A number of rules for the planning and layout of industrial lighting systems have been offered in connection with a brief consideration of the several types of reflecting equipment available. Spacing recommendations and minimum intensities for several classes of work, from casting and heavy foundry duty to office illumination, have been included. The accompanying chart is suggested as a ready means for determining the size of lamp that should be used with various spacings in order to procure the desired effects.—*Industrial Engineering,* July, 1928.



Lamp sizes may be determined if intensities and spacings are known

Traction

Interconnection of Power and Railroad Traction Systems by Means of Frequency Changers.—LUDWIG ENCKE.—Practical operating results obtained with several types of frequency changers designed to permit a flexible tie between interconnected systems and accurate and automatic control of load, regardless of variations in voltage or frequency in either system, have been discussed. It is stated by the author that any desired constant load transfer in either direction may be obtained with this apparatus through the proper manipulation of a load-regulating relay. In this instance provision is also made for operating sets as synchronous condensers to improve power factor.—*Journal of the American Institute of Electrical Engineers,* July, 1928.

Telegraphy, Telephony, Radio and Signals

A Commercial Aluminum Electrolytic Rectifier.—WALTER E. HOLLAND.—Considerable improvements in the anode, cathode and electrolyte have been made, according to the author, in the aluminum electrolytic rectifier subsequent to the advent of radio broadcasting. Results of research work relating to these improvements, as well as to the difficulties encountered, have been mentioned and certain commercial rectifiers described. Performance data have been included for several devices.—*Report American Electrochemical Society,* April, 1928.

Miscellaneous

Soil-Corrosion Studies. — K. H. LOGAN, S. P. EWING and C. D. YEOMANS.—As a result of a number of years of study of corrosion due to stray electric currents in the earth it has become evident that in some cases the cause of observed corrosion cannot be decided until it is known whether serious corrosion could occur in uncontaminated soil where no stray currents are present. This investigation of soils, materials and results of early observations has been undertaken to determine such factors. The original investigation, planned to be of a practical nature and quite limited in its scope, has been amplified by the acquisition of additional data in field and laboratory determinations. Specimens buried in selected soils will, it is planned, be removed at about two-year intervals for a period of ten years, and a number of these have been recovered according to this schedule. The work is in its initial stage and will not be completed for some time. It is indicated that in certain regions soil corrosion is an active enemy of buried pipe lines, that the material best suited to reduce the action of one soil is not necessarily the best for other soil conditions and that the use of some form of protective coating is desirable in many instances. It is stated that because the rates of corrosion so far observed may not continue, and because the rate for one material may change more than the rate for another, no conclusions are desirable as to their ultimate life.—*No. 368, Technologic Papers of the Bureau of Standards.*

News of the Industry

Consolidated Gas-Brooklyn Edison Situation

As the ELECTRICAL WORLD goes to press the New York Public Service Commission is again in session over the proposed consolidation of the Brooklyn Edison Company with the Consolidated Gas Company of New York, Commissioner Van Namee having canceled a passage to Europe. Three outcomes of the meeting are possible, but none can be predicted. By a change of vote the opponents of the application may be heard, without a vote on this point the application may be approved, or the two-to-two deadlock may be maintained, forcing a decision to wait until Commissioner Brewster is able to take part. (See last week's ELECTRICAL WORLD, page 226.)

Severe Storm Interferes with Service in South Florida

A storm in south and central Florida approaching the dimensions of a hurricane wrought considerable damage to electric service on Tuesday and Wednesday of this week, according to Associated Press reports, in connection with widespread injury to crops, although no lives were lost and general destruction was small compared with that inflicted by the hurricane of 1926. These press reports say that the high-tension transmission line of the Florida Power & Light Company between Titusville and West Palm Beach was broken, causing the suspension of electric service in a territory extending 125 miles. The municipal lighting plant at Fort Pierce, where the storm was particularly violent, is reported as partly destroyed. This plant had a capacity of 2,800 kva. The storm passed over Florida from the Atlantic to the Gulf Coast, and the center of the disturbance was expected to pass north of Tampa. No destruction in the larger cities was reported up to Thursday morning.

"Radio Movies" Are Demonstrated at East Pittsburgh

Men prominent in the radio world assembled at East Pittsburgh on Aug. 8 to visit the laboratories of the Westinghouse Electric & Manufacturing Company and review the progress in such work as television, fac-simile radio power tubes, photophone and broadcast motion pictures. The most striking of these developments was the broadcasting of motion pictures which, transmitted on radio waves, were picked up on a receiver in the Westinghouse television laboratories and reproduced before those assembled there.

While "radio movies" are still in the laboratory stage, H. P. Davis, vice-president of the Westinghouse company, under whose auspices the demonstration was made, said that the event heralds the time when the radio listener can sit at home and have motion pictures projected by his individual radio receiver. Barely two months ago, it was stated, the idea came to the mind of Dr. Frank Conrad, in charge of this branch of his company's activities, and the fact that he has brought the device to the laboratory stage in the degree of perfection witnessed is thought almost unprecedented in experiments of this kind. Westinghouse officials say that the regular transmission of pictures will begin in a few weeks from the Westinghouse Pittsburgh radio station, KDKA.

New Officers for the N.E.L.A.

One Vice-President Still to Be Appointed—Sampsell, Stone and Owens Will Head Commercial, Engineering and Public Relations Sections Respectively

APPOINTMENT of the new national section heads and national committees of the National Electric Light Association is approaching completion at the New York headquarters under President Arkwright. There is a vacancy to be filled in the list of vice-presidents of the association, Arthur W. Thompson of Philadelphia not having seen his way to accept the nomination made by the national convention at Atlantic City in June. No officers for the Accounting National Section have yet been determined, and the personnel of the Commercial National Section is still in a state of flux. Marshall E. Sampsell of the Central Illinois Public Service Company, Chicago, has, however, been appointed head of the last-named section. The Engineering National Section and the Public Relations National Section appointments are complete. E. C. Stone of the Duquesne Light Company, Pittsburgh, will again head the former section, and J. F. Owens, Oklahoma Gas & Electric Company, the latter.

The national executive committee will contain, besides the president and vice-presidents, treasurer, managing director and secretary, the national section chairmen and the locally elected geographic division presidents, the following members-at-large:

Term expiring June 30, 1929.—H. T. Sands, New York; C. L. Collens, Cleveland; G. E. Cullinan, New York; E. W. Lloyd, Chicago; Harry Reid, New York; James R. Strong, New York.

Term expiring June 30, 1930.—D. C. Barnes, Boston; H. P. Liversidge, Philadelphia; Gerard Swope, New York.

Term expiring June 30, 1931.— John P. Coghlan, San Francisco; H. M. Edwards, New York; E. M. Herr, New York.

Chairmen of the general national committees are as follows:

Civic Development — John B. Reynolds, Chicago.
Educational—Fred R. Jenkins, Chicago.
Insurance—Arthur Williams, New York.
Membership—Howard K. Mohr, Philadelphia.
Rural Electric Service—Charles F. Stuart, Minneapolis.

Following are the appointments as chairmen of special national committees:

Advertising—Frank L. Blanchard, New York.
Charles A. Coffin Prize—P. S. Arkwright, Atlanta.
Codes and Standards — Irvin W. Day, Waterbury, Conn.
Constitution and Bylaws—R. F. Pack, Minneapolis.
Electrification of Steam Railroads—Britton I. Budd, Chicago.
Exhibition—E. W. Goldsmith, New York.
Finance—Sidney Z. Mitchell, New York.
Lamp—Frank W. Smith, New York.
Prize Awards—W. H. Onken, Jr., New York.
Public Policy—R. H. Ballard, Los Angeles, Cal.
Water-Power Development — Paul A. Schoellkopf, Niagara Falls, N. Y.

E. A. Barrows of Providence, Leavitt Edgar of Boston and D. C. Green of Salt Lake City will be vice-chairmen of the Public Relations National Section, and A. D. Bailey of Chicago, T. Sproule of Newark, N. J., and N. Stahl of Allentown, Pa., will be vice-chairmen of the Engineering National Section.

Commission Questionnaire May Cost $10,000,000

Further delays at the Government Printing Office have deferred again the probable date of the distribution of the Federal Trade Commission's new public utilities questionnaire. The distribution of this inquiry probably will not begin, it now appears, until the week of Aug. 20. While the commission has given out no detailed information as to the questionnaire, it is known that it covers more than two hundred printed pages. It is thought to be more comprehensive than the questionnaire sent out by the United States Coal Commission in 1924. In the opinion of the then president of the National Coal Association, expressed in a formal communication to the commission, that questionnaire cost the industry more than $5,000,000. With that estimate as a basis, it is thought prob-

able that the utilities, management companies and financial houses will be called upon to expend in excess of $10,000,000 to comply with this latest request of the Federal Trade Commission.

League Men Gather for a Six-Day Conference

Industry Leaders and Business Leaders from Outside the Fraternity Are Heard by 240 Representatives of Widely Scattered Local Bodies

WITH 240 representatives of local electrical leagues in attendance, the annual league conference convened on Thursday of last week in Camp Co-operation VIII at Association Island, Henderson Harbor, N. Y., continuing until Tuesday, Aug. 7. J. E. North, chairman of the League Council, presided.

In meetings held each morning and evening spokesmen for the major branches of the industry appeared before the league men to review and interpret the activities of the national association and the progress of the various movements that are afoot. A number of distinguished speakers from without the industry brought new viewpoints on the problems of market development. It was a hard-working convention that carried the work of league development and service one more step forward.

Clarence L. Collens, vice-president of the National Electrical Manufacturers' Association and chairman of the Policies Division of that body, made the opening address at the flag-raising ceremonies and voiced a plea for more consistent and practical co-ordination between electrical men in every-day work instead of temporary co-operation in times of emergency. Paul S. Clapp, manager director of the National Electric Light Association; A. E. Waller, manager director of the N.E.M.A., and Laurence W. Davis, general manager of the Association of Electragists International, extended the greetings of their organizations and discussed the opportunities to further the advancement of electrical progress through the local leadership of the leagues.

A very comprehensive review of major industry activities followed. W. E. Sprackling, chairman of the Industry Sales Conference, outlined the status of the market study that is now in progress looking to the development of a broad industry marketing program in which the leagues must play an important part. Ernest Greenwood, N.E.L.A. commercial director, presented the purposes and results of the inter-trade conferences on merchandising practice held last winter. W. H. Hodges, vice-president of H. M. Byllesby & Company, explained the home modernization movement now being conducted by the building trades and its significance to the electrical industry. H. B. Kirkland reported on the promotion of the uniform ordinance in which the N.E.M.A. and the Society for Electrical Development are co-operating.

Stanley Dennis, editor of the *Electrical Record,* presented a paper analyzing the history of the "red seal" plan for increasing adequacy of house wiring and the results so far obtained. S. G. Hibben outlined the developments of the year in lighting. Miss Eloise Davison, N.E.L.A. home economics adviser, discussed the need for more school training in the use of electricity.

Under the title "The Customer Decides," Paul Cherington of J. Walter Thompson & Company, who is directing the market study now being made for the Industry Sales Conference, made a masterful analysis of the competitive popular market now so important.

Dr. Hugh P. Baker, manager of the trade association department of the United States Chamber of Commerce, pointed to the opportunity for the leagues to contribute to this building of business policies in the industry and the present scope of trade association work under the more liberal attitude taken by the government. S. J. Ryan, president of a prominent New England department-store company, contrasted present-day practice in electrical merchandising with the policies of older merchants, and showed the similarity of their basic problems but the greater expertness of the department store in coping with them. Congressman Charles A. Eaton delivered an inspirational address on Sunday evening.

Interest was centered largely in the conduct and policies of the "red seal" plan that now constitutes the principal activity of the league and the development of the "Franklin specifications" for commercial and industrial lighting which are now being promoted on a national basis as a further field for league co-operation.

Twenty-three men were elected to serve as the League Council for the coming year. R. Burke Corcoran, Chicago, was elected chairman of the council and D. C. Birdsell, Philadelphia, vice-chairman.

Philip Cabot Addresses Electragists

Harvard Economist Criticises Central-Station Men Who Do Not Live Up to Their Own Merchandising Principles—Chicago Convention Highly Successful

UNDER the title "Are Public Utility Merchandising Methods Fair?" Philip Cabot, economist of the Harvard Graduate School of Business Administration, presented before the Association of Electragists International on Wednesday, Aug. 8, in Chicago, conclusions based on a survey of trade practices in the electrical appliance market. This was the twenty-eighth annual convention of the national association of the contractors and dealers, in session at the Hotel Stevens with a registration of nearly a thousand.

Mr. Cabot, who had been commissioned by the association to study the present market situation and report, heartily indorsed the present attitude of the leaders of both the central-station and contracting branches of the industry in their expressed agreement upon the fundamental principles involved, but he pointed out that all the members of the associations of these groups are not living up to their principles in their own localities. The central-station companies, he said, are departing from sound business policy in the form of price cutting and the giving of extravagant installment credit and through unfair methods used by salesmen paid by commission. Power-company policy, he held, should be to develop the largest possible number of well-managed independent outlets selling appliances. Mr. Cabot believed the companies' own position in the retail merchandising field is only temporary.

"The business of the central-station companies," the speaker said, "is to provide electric service, of which they are granted a monopoly, and when they depart from this field they should walk upright and with great caution. They should scrupulously maintain fair prices at which all honest and efficient competitors can make a living."

E. O. Shreve of the General Electric Company discussed the problems of distributing motors and urged a closer co-operation between the manufacturer and dealer that the dealer may be a strong selling force and not a mere order taker, as he has become, largely through the neglect of the manufacturer. M. C. Morrow, vice-president of the National Electrical Manufacturers' Association, explained the basis on which a closer co-ordination can be established with the electragists in the development of the code and other common interests. L. K. Comstock presented a comprehensive analysis of "The New Co-operation," through which the contractor is to solve his problems, and a committee was appointed to plan for action. John F. Gilchrist, under the title "A Midsummer Night's Dream," discussed the basic need for the good of the entire industry that the contracting group should be brought to greater prosperity and a better economic condition.

Other speakers were S. B. Williams on "Wasted Profits," Victor H. Tousley on the present trend of the code, F. P. Vose on credit policies, and J. J. Caddigan, who described and illustrated the methods used by the Boston Edison company in practical co-operation with the contractor-dealers. H. B. Kirkland was to speak on Friday on "State Enabling Acts and Licensing."

Chicago electrical men provided an elaborate entertainment, and despite the heat the convention was rated the most successful in the history of the association, with an exhibition participated in by 45 manufacturers. President Clyde L. Chamblin of San Francisco presided and delivered the president's message.

Plan Rate Reductions in Middle West

Commonwealth Edison Will Make Another Rate Cut

The Commonwealth Edison Company announced on July 1 that it has petitioned the Illinois Commerce Commission for permission to adopt a new rate schedule, to be effective Sept. 1, by which the company estimates small commercial users would save $1,250,000 a year. The company estimates that it has about 113,000 customers who would be affected by the proposed new rates.

Like a similar change of rates in April, the use of the new schedule would be optional with a consumer of energy; that is, if he does not find his bills lower under the new plan, he may elect to be billed under the present plan.

The new rate consists of a charge of $2.20 a month per kilowatt of maximum demand and a straight charge of 2.7 cents per kilowatt-hour for the electricity used. The monthly reduction for the average customer, demanding 1½ kw. and using 266 kw.-hr. a month, is figured at 65 cents, as follows:

OLD SCHEDULE

45 kw.-hr. at 8 cents	$3.60
45 kw.-hr. at 5 cents	2.25
176 kw.-hr. at 3 cents	5.28
Total	$11.13

NEW SCHEDULE

1½ kw. maximum demand at $2.20	$3.30
266 kw.-hr. at 2.7 cents	7.18
Total	$10.48

Another 10 per Cent Cut at Grand Island, Neb.

The Central Power Company of Grand Island, Neb., has announced a 10 per cent reduction in residence and commercial rates. The new top price is 11 cents for the first 11 kw.-hr. per room and 11 cents for the equivalent of the first 30 hours' use of 75 per cent of the actual connected load. This is the third reduction in two years, the first being 25 per cent and the second 15 per cent.

Ohio Power Company Proposes Cut in 300 Towns

A reduction of approximately $400,000 annually in the bills of customers of the Ohio Power Company in nearly three hundred towns and villages in Ohio is said by the company to inhere in a new rate schedule which it filed with the Public Utilities Commission Aug. 2, to become effective Sept. 4. The new schedule revises residential and commercial lighting rates. The Ohio Power Company, with headquarters at Canton, is a consolidated unit of a number of separate utility companies, each of which has its own set of rate schedules. The proposed revision will equalize the lighting rates for each class of service so that customers in all parts of the state will have approximately equal rates.

The new rates for lighting purposes are 8 cents for each of the first 30 kw.-hr., 7 cents for the next 30, 6 cents for the next 40, and 5 cents for all over 100. These rates are based on a minimum charge of 50 cents per month. If users wish to contract for a minimum charge of $1 a month, they will have a base rate of 7.5 cents for the first 30 kw.-hr., the remainder of the schedule being 6, 5 and 4 cents.

Illinois Power & Light Wants to Cut Electric Rates

A program of electric rate reductions in 450 communities in Illinois, based upon success in securing increases in electric railway and bus service and steam-heating plant service, was outlined by J. W. Johnson, operating vice-president of the Illinois Power & Light Corporation, at a recent hearing in Springfield in support of the company's petition for the rate increases sought. The hearings have been continued to Sept. 20. Mr. Johnson said that under present schedules losses in the street railway and steam-heating services of his company are made up by the electric department. The reductions proposed in electric rates would affect two hundred thousand customers. The basic standard would bring a maximum rate of 8 cents a kilowatt-hour for communities in which there are more than 10,000 meters, of 10 cents in communities with between 1,000 and 10,000 meters, and of 12 cents in communities with less than 1,000 meters. Reductions have already been made in some communities in accordance with this policy.

Proposed Change of Rates in Little Rock, Ark.

A schedule of revised rates prepared by the Arkansas Power & Light Company for Little Rock and now under scrutiny by the civic officials of that city shows substantial savings for the majority of 125 representative citizens whose names were selected at random from the city directory and whose occupations range from laborer to doctor and lawyer. In no case is an increase in bills under the proposed rates indicated.

The residence consumer and small commercial user now pay 10 cents per kilowatt-hour for electricity. Under the proposed new schedule 12 1-2 cents per room per month would be charged for the first four rooms, and for all additional rooms 10 cents per month would be added, establishing a flat rate of 50 cents on a four-room house, 60 cents on a five-room house and so on. To this would be added 7 cents per kilowatt-hour for each 6 kw.-hr. per room per month, 5 cents for the next 100 kw.-hr. and 3 cents for any excess. The saving would in many instances amount to 25 per cent.

Investigating Lightning on 220-Volt Lines

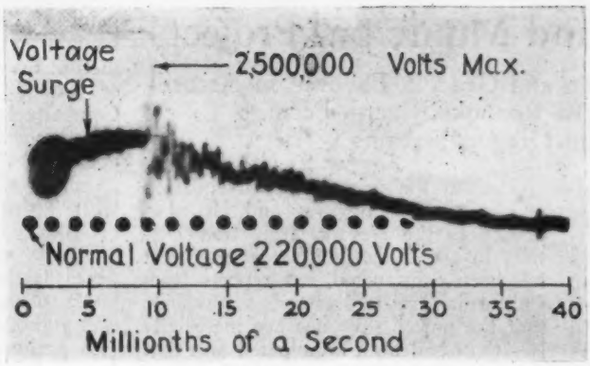
General Electric Engineers Co-operate with Power Company Technicians on Pennsylvania Power & Light System—Oscillogram of Stroke on Lines

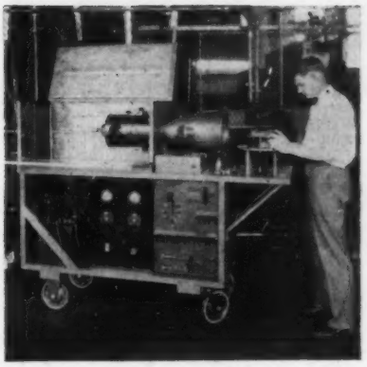
IN THE foothills of the Allegheny Mountains, near Lake Wallenpaupack, Pa., where engineers of the General Electric Company have been co-operating in experiments and investigations on the 220-kv. transmission lines of the Pennsylvania Power & Light system for more than three years in an endeavor to ascertain the characteristics of lightning, a photographic record has been obtained showing the nature of a lightning stroke on transmission wires before reaching the ground. This is the first 220-volt line ever built in a territory subject to frequent violent thunderstorms.

This picture, declared to be the first of its kind ever made in the world, was taken at Friday noon, July 27, and reveals a stroke on the transmission wires of approximately 2,500,000 volts. It was made automatically by a cathode-ray oscillograph developed in the general engineering laboratory of the General Electric Company.

The General Electric Company, in co-operation with the Pennsylvania Power & Light Company, the Philadelphia Electric Company and the Public Service Electric & Gas Company of New Jersey, began this study of natural lightning on transmission lines in 1925. The cathode-ray oscillograph had not been developed at that time and various types of surge recorders were used. Early this summer engineers of the above-mentioned companies, with F. W. Peek, who is credited with having done more experimenting with artificial lightning than any other living engineer and who recently announced an artificial flash of more than 3,500,000 volts, made an inspection of the 65-mile, 220-kv. line of the Pennsylvania Power & Light Company, extending from Wallenpaupack to Siegfried, and selected a location for the experimental laboratory in the hills adjoining Wallenpaupack.

Less than a week after the cathode-ray high-speed camera had been put in working order the awaited thunderstorm arrived and the picture was taken. The negative showed that before five-millionths of a second had passed the voltage wave had climbed to more than 1,500,000 volts. A local disturbance, due to an induction flashover and reflection, caused a rise to 2,500,000 volts in a fraction of a millionth of a second. This splash or ripple then died down in a millionth of a second, and the wave passed to below dangerous value in about ten-millionths of a second and





Field laboratory, oscillogram and portable cathode-ray oscillograph (open)

then to zero, all in a total of forty-millionths of a second.

The results attained show characteristics closely in line with predictions made by Mr. Peek in a paper presented before the Franklin Institute in Philadelphia in September, 1924, based on his many years of experimenting with artificial lightning in the General Electric Company's high-voltage laboratory at Pittsfield, Mass.

The field laboratory has been planned in the expectation of continued observations on natural lightning, with the realization that a great many data will be required before achieving the practical solution of lightning control on transmission systems.

Purchases and Mergers

Rumor that Western Colorado Power Company May Change Hands—Lafayette, La., Votes Down Sale of City Plant—Helena (Mont.) Plant Bought

UNAUTHORIZED reports from Denver say that the Public Service Company of Colorado, the chief Doherty property in that state, is negotiating for the purchase of the Western Colorado Power Company. The Western Colorado is a subsidiary of the Utah Power & Light Company of Salt Lake City, both being under the supervision of the Electric Bond & Share Company, New York, and controlled by the Electric Power & Light Corporation. Its acquisition by the Doherty interests would add Durango, Telluride, Montrose, Delta and other territory in the mining section of Colorado to the Public Service system.

The proposal of the Gulf States Utilities Company of Beaumont, Tex., to buy the municipal electric light and water plant at Lafayette, La., for $800,000 was defeated by the voters at the election held on July 30. The Gulf States company is managed by Stone & Webster.

The American Power & Light Company is acquiring the Helena (Mont.) Gas & Electric Company. Steps are being taken to dissolve the Helena company, and the American Power & Light will assume all obligations.

The Smith River Power Company, Smith River, Cal., has been acquired by the Public Utilities California Corporation, a subsidiary of the Public Utilities Consolidated Corporation, a W. B. Foshay holding company.

Sale of the Blowing Rock (N. C.) Power & Light Company to Cleveland (Ohio) investors is announced. It is said that other western North Carolina territory is to be acquired and a generating plant built in a central location.

The town of Irwin, Iowa, has voted by 153 to 15 to sell its power distributing system to the Iowa Public Service Company.

A majority of eight votes in a total poll of 277 was returned by voters of Elkhorn, Iowa, in favor of a proposal for sale of the municipal electrical distribution system to the Iowa Public Service Company. The town of Kimballton, which has a three-year contract with Elkhorn to furnish electric power, has threatened suit, declaring the Elkhorn contract illegal because of the contract with Kimballtown.

The Rockport (Mo.) Light & Power Company has filed application with the Missouri Public Service Commission for authority to sell its electrical distribution system in Rockport to the Tarkio (Mo.) Electric & Water Company for $50,000.

The Iowa-Nebraska Light & Power Company has purchased the Germantown Light & Power Company of Garland, Neb.: the Thayer Electric Company of Thayer, Neb., to be supplied by a transmission line from York; a small privately owned plant at Emerald, to be dismantled and service given from Lincoln, and a franchise at Cornlea, where a company quit service eight months ago.

The Hydro-Electric Power Company of Theresa, N. Y., is understood to be negotiating for the sale of its water-power rights to the St. Lawrence County Utilities. At present the company furnishes power to light the villages of Orleans, Four Corners and Lafargeville.

The Berlin Electric Light, Heat & Power Company, serving the towns of Berlin and Petersburg, N. Y., has made application to the Public Service Commission for consent to the transfer of its franchises, works and system to the Eastern New York Electric & Gas Company of Mechanicville.

Formal transfer of the High Spire (Pa.) Power & Light Company to the Harrisburg Light & Power Company has been filed at Harrisburg, Pa.

The Penn-Ohio Edison Company, controlled by the Allied Power & Lighting Company, has purchased the stock of the People's Power Company and of the Harmony Electric Company, serving western Pennsylvania communities, from D. I. Cahill and H. E. Atheridge.

Decision has been made by the municipality of Liverpool, Nova Scotia, to sell its hydro-electric system to the Nova Scotia Power Commission for a price to be agreed upon, the town to purchase from the commission for a period of thirty years the power it requires at a price not to exceed 0.5 cent per kilowatt-hour. This is a sequel to the work now being undertaken by the government of Nova Scotia, through its power commission, in developing the hydro energy of the Mersey River in order to supply a pulp mill being erected at Liverpool by the Killam interests.

W. B. Foshay, president of the Minneapolis company bearing his name, has announced the purchase, through the Central American Power Corporation, organized for the purpose, of the electric light, ice and water systems of Managua, capital of Nicaragua. "The transaction represents a cash consideration of more than $700,000," Mr. Foshay said.

The Troy Graham Company of Chicago has acquired from Francisco Gutiérrez the electric light plant which supplies the city of Victoria de las Tunas, Cuba, with electric light and power. The price is given as $333,000.

Minimum Price of Worcester Company, $21,600,000

F. E. Comerford, president of the New England Power Association, being questioned recently regarding the report that negotiations are near consummation for the purchase of the Worcester Electric Light Company, said that there had been no negotiations between his association and the Worcester company and that none are pending or contemplated. A director of the Worcester company declared that his company would not be interested in any offer for its stock until a decision is handed down by the United States courts in the pending five-cent rate case.

It has been believed for many months in financial circles at Worcester that the New England Power Association would like to buy the Worcester company as it forms a strategic link in the system now being developed by the association. But whether this link is worth $21,600,000, the minimum price at which the voting trustees may sell, the association, or its owner, the International Paper Company, has yet to decide. The New England Power Association at present owns about 7,000 shares in the Worcester company, but this holding is nowhere near controlling point as the 96,000 shares outstanding are worth today around 196.

Power Commission and Municipal Projects

Public Undertakings in Michigan and Georgia Favored in Accordance with Law—Conflict on Roanoke River—Permits on Missouri and Oregon Streams

TWO municipal hydro-electric projects were subjects of favorable action by the Federal Power Commission at its last meeting. A license was authorized for a development by Crisp County, Ga., and a preliminary permit was given the city of Allegan, Mich. In the latter case the preliminary permit was granted the municipality even though a conflicting application of the local power company apparently provides for a more comprehensive development than the city of Allegan could attempt. The provision in the law according priority to municipalities evidently was considered by the commission to be sufficient to outweigh the advantages of the better development the private company was in position to provide. In the Crisp County case there was no conflicting application, but the power is to be furnished in an area now being served by a private company which is in a position to furnish efficient and economical service and to meet all requirements.

The commission also has pending a conflict between the Yosemite Power Company and the Turlock and Modesto irrigation districts on the Tuolumne River in California. In this case the private company has applied for a license covering a project in which it has been actively interested for fifteen years and which has been before the commission for seven years. The irrigation districts applied for a preliminary permit less than two years ago. Conclusions have not been announced as yet in this case, but it appears probable that the commission will not fail to accord to the irrigation districts the full measure of preference that municipalities have received in the other cases.

An example of what sometimes happens when arbitrary legal preferment is allowed to govern, rather than a decision based on sound engineering and economic facts, is had in the case of the Nevada Irrigation District of California and the Yuba River Power Company. That conflict involved the development of the water of the Yuba River. The irrigation district proposed to divert the waters of that stream into the Bear River watershed for sale to the Pacific Gas & Electric Company for use in the power plants of its Bear River system, the water after release to be so diverted that it would be available for irrigation purposes. The sale of the water was intended to provide for the financing of the irrigation development without any material charge against the lands to be irrigated. The irrigation district, notwithstanding the predominance of the power features in this scheme, claimed the preference that the water-power act accords to municipalities. Despite the admitted superiority of the plan of the Yuba River Power Company, the commission yielded to the urgent recommendation of the state authorities and issued a license to the Nevada Irrigation District in the fall of 1925. The project has been constructed, but reports from California are understood to indicate that the power revenues are materially less than had been anticipated and that the construction costs were higher than the estimates. The manager of the district has resigned and an additional bond issue is declared to be necessary.

Roanoke River Again

The Virginia-Carolina Power Company (of North Carolina) has applied to the Federal Power Commission for a preliminary permit covering a 23,000-hp. project on the Roanoke River near Roanoke Rapids, N. C. On Site A the company desires to put its dam near the head of Clement's Island, 9 miles upstream from Roanoke Rapids. This will form a pool extending to the tailrace of the Buggs Island plant of the Roanoke River Power Company. A head of 65 ft. will be attained. Site B is 7½ miles downstream from Site A and nine miles upstream from Weldon, N. C. The pool in that instance extends to the tailrace of Site A. A head of 42 ft. would be created. At Site A 13,800 hp. of primary power will be made available and 87,000 hp. installed. At Site B the primary power is estimated at 9,400 hp., and it is planned to install 56,000 hp. at that point. The application conflicts with one recently filed by the Virginia-Carolina Power Company (of Virginia). Despite the similarity in name, there is no connection between the two companies; the North Carolina company is understood to be a subsidiary of the Virginia Electric & Power Company. The North Carolina company has retained Stone & Webster as its engineers, and the Virginia company has retained Vielé, Blackwell & Buck.

Ben H. Kizer and others of Spokane, Wash., have applied for a preliminary permit covering a 2,800-hp. project on Sheep Creek near Northport, Wash. It is proposed to build a diversion dam in the main stream, where a head of 520 ft. can be obtained. There is to be a storage dam on Big Sheep Creek in which the water will be backed up to a point near the international boundary line. A conduit will conduct the water from the storage dam to a second power house alongside the forebay of the diversion works. It is planned to install 12,000 hp.

The Dixie Power Company of Cedar City, Utah, has applied for a license covering a transmission line 24 miles long to run from Leeds to Zion National Park.

In view of a report from the Chief of Engineers holding that a dam in Black River near Leeper, Mo., is capable of having an adverse effect on navigation, the commission took jurisdiction over the proposed development of the Black River Hydro-Electric Company at that point.

A preliminary permit to the Gasconade River Power Company for the construction of a dam about 95 ft. high, with appurtenant structures, on the Gasconade River, near Rich Fountain, Mo., with a probable installed capacity of 25,000 hp., which the company proposes to use for public utility purposes, was authorized.

A preliminary permit was authorized for the Deschutes Falls Power Company for the construction of a dam 60 ft. high, a reservoir, conduit and power house on the Deschutes River, in Sherman and Wasco Counties, Ore. The power will be used for public utility purposes.

Another preliminary permit was authorized for the city of Eugene, Ore., for a series of dams, reservoirs and power houses on the McKenzie River. The ultimate installed capacity of the project is put at 32,000 hp., which is for use for general municipal purposes in connection with the present plant of the city on the McKenzie River.

The clause covering unit No. 1, of the license to the Molybdenum Corporation of America, covering two water-power plants on the Red River, in New Mexico, was canceled, the company having asked that this unit be eliminated from the license because not needed at the present time. The license issued to the Deschutes Power & Light Company for a transmission line in Deschutes and Jefferson Counties, Ore., was terminated for the reason that the company failed to commence construction work within the time specified in the license.

Street-Lighting Prices to Go Up at Tacoma

Rates charged the city of Tacoma, Wash., by its power department for street lighting, which for several years have totaled $71,000 and previously were even less, are to be increased in accordance with a new city charter, which says that the city must pay the same rate that a private customer would pay for comparable service, instead of accepting a virtual subsidy from the power department toward its general budget. Commissioner Ira S. Davidson has long been contending for more pay for street lighting.

Final reports by the city utilities engineer, Kenneth G. Harlan, indicate an increase in the charge to a little above $106,000—$11 to $25.25 per year to be charged for bracket lights ranging from 100 cp. to 600 cp., $6.70 to $28.20 for ornamental incandescent lamps ranging from 100 cp. to 1,000 cp., and $40.50 each for the large luminous-arc lights used on downtown streets. The city claims that even after these increases the bill for lighting will be only half that of the next lowest in any city in America, which, it says, is New Bedford, Mass.

Briefer News

PLAN MILLION-DOLLAR ADDITION TO MONTREAL ELECTRIC SYSTEM. — Plans have been prepared by the Montreal Light, Heat & Power Consolidated for the erection of a new transformer and switching station at a cost of $1,000,000. The plant will not be completed until about the end of 1929.

POTOMAC ELECTRIC POWER COMPANY'S NEW UNIT. — The additional 30,000-kw. generator ordered some time ago by the Potomac Electric Power Company for its Benning power plant at Washington is expected to be installed within four months. This increase in power facilities involves an expenditure of $2,500,000.

IMPROVEMENTS IN WESTCHESTER COUNTY, N. Y.—Eugene H. Rosenquest, president of the Westchester Lighting Company, Mount Vernon, N. Y., announces that it means to spend $2,000,000 on improvements in the next twelve months. The principal item will be $325,000 for a substation at Elmsford. Additional transmission and distribution lines throughout Westchester County will be erected.

NEW GENERATING UNIT FOR BIG FORK (MONT.) STATION.—An additional 1,750-kw. generating unit will be installed soon at the Big Fork hydroelectric station near Kalispell, Mont., increasing its capacity to 4,450 kw. The Mountain States Power Company has entered into a contract to supply the People's West Coast Hydro-Electric Company with all the electricity required by the town of Reedsport, Ore.

PLANS FOR WINOOSKI RIVER PLANT IN VERMONT.—The People's Hydro-Electric Vermont Corporation, a subsidiary of the People's Light & Power Corporation, has let the contract for a new dam and power plant to be built on the Winooski River between Burlington and Montpelier, Vt. The dam will be of reinforced-concrete construction, providing a head of 48 ft. The power plant will contain two vertical generators, directly connected to waterwheels, having a total capacity of about 4,500 hp. The plant is expected to be ready for operation about Oct. 1.

BROAD RIVER STEAM STATION TO BE INCREASED BY 30,000-KW. UNIT.—Plans for further increasing the generating capacity in South Carolina of the General Gas & Electric system have just been announced. The Parr Shoals steam station of the Broad River Power Company, a subsidiary, will add another 30,000-kw. unit. Upon completion of this unit a year hence the Parr Shoals plant will have a generating capacity aggregating 72,500 kw. These new facilities will be tied in with those of the Lexington Water Power Company, another subsidiary, the big plant of which on the Saluda River is to have an initial capacity of 200,000 hp. and an ultimate rating of 275,000 hp.

VIENNA (MD.) PLANT TO BE DOUBLED IN CAPACITY.—The Eastern Shore Public Service Company will double the capacity of its new power plant at Vienna, Md., which went into operation early in June, by the installation of an additional 7,500-kw. turbine-driven unit, to be housed in a 40-ft. addition to the present building. The new unit will be ready for operation in November.

NEW OFFICERS OF MICHIGAN ELECTRIC LIGHT ASSOCIATION.—The following are the officers elected for 1928-29 at the recent Mackinac Island convention of the Michigan Electric Light Association: President, Howard Pett, Consumers Power Company, Jackson; first vice-president, E. L. Edwards, Michigan Electric Power Company, Lapeer; second vice-president, D. W. Hayes, Detroit Edison Company, Port Huron; secretary-treasurer, Herbert Silvester, Detroit Edison Company, Ann Arbor.

NEW CONSTRUCTION BY ARKANSAS POWER & LIGHT COMPANY.—The Arkansas Power & Light Company will construct a large substation on a five-acre tract near Magnolia, to which a line will be built from Camden. The company will also run a 13,000-kw. transmission line from Arkadelphia to Sparkman, Ark., a distance of 25 miles, and work will start in 30 days. This line will follow the route of an abandoned railroad to Dalark, and power will be furnished from the company's substation at Arkadelphia.

CORDELE (GA.) PLANT GOING AHEAD.—Contracts for nearly $1,000,000 have been let by the Power Commission of Crisp County, Ga., for the construction of the long-agitated Crisp County power plant near Cordele. This involves a dam across the Flint River, to cost $777,000, and electric and hydraulic machinery. With transmission lines the total cost of the 18,000-hp. plant is expected to be $1,250,000. Work on the dam will start at once, and the plant will be rushed to completion.

ROCHESTER COMPANY WILL BUILD HALF-MILE TUNNEL TO INCREASE ITS OUTPUT.—The technical closing of six downtown streets in Rochester, N. Y., the first step in construction of a tunnel on the Genesee River which eventually will make possible a 55,000-hp. unit, has been permitted, at the instance of the Rochester Gas & Electric Corporation, by the City Council, and Thomas H. Yawger, electrical superintendent for the power company, says work will be begun as soon as the plan has been finally approved by the city authorities. The tunnel, beginning at the upper falls on the west side of the river and

Martin Dam During the Recent Alabama Floods

FOR the first time since the Martin Dam development of the Alabama Power Company was placed in operation (September, 1926), the 60,000,000,000-cu.ft. reservoir filled to overflowing recently and water had to be released through the gates as shown above. An interesting feature of this project is the stilling pool formed by an auxiliary dam, 22 ft. high, directly below the main dam. Twelve spillway gates, 18 ft. x 30 ft. (seven of which are shown opened), discharge into this basin, where the energy of the waste water is dissipated and erosion at the toe of the dam prevented. In case of extremely high floods eight additional gates may be opened, which discharge below the auxiliary dam in such a way that the discharge strikes the water flowing over the auxiliary dam at right angles, thus dissipating its energy. The installed capacity at Martin Dam is 135,000 hp. in three units, with provision for a fourth unit.

continuing diagonally to a point below the Court Street dam on the west side, will be 2,800 ft. long, 22 ft. to 24 ft. in diameter and of horseshoe shape. The drop from the upper to the lower end will be 130 ft. and at the falls 96 ft. The power company now operates the Court Street dam. The tunnel is to feed into a power station at the upper falls.

GROUND BROKEN FOR NEW HEADQUARTERS BUILDING AT TULSA.—Ground has been turned in Tulsa for a five-story office building for the Public Service Company of Oklahoma, which will be one of the best arranged and most modern utility headquarters in the Southwest. The structure will cover an area 80 ft. on Main Street and 140 ft. on Sixth Street. It will house, in addition to offices, display rooms and all the usual departments, a complete modern home of five rooms, fully equipped with electric appliances.

STEAM PLANT FOR BLACK WARRIOR RIVER, ALA. — Contract has been awarded to the United Engineers & Constructors, Inc., of Philadelphia to design, construct and equip a power plant for the Gulf States Service Company at Tuscaloosa, Ala., Dwight P. Robinson, president of the construction company, announces. The plant, which will cost approximately $1,000,000, will be built on the Black Warrior River and will supply the process steam and electric power requirements of the Gulf States Paper Company. The design calls for one 7,500-kw. steam turbine and three 1,000-hp. boilers. Pulverized coal will be burned.

HUGE REFUND DUE NEW ORLEANS USERS OF ELECTRICITY, CITY ATTORNEY SAYS.—An opinion that New Orleans consumers of electricity are entitled to a refund of 30 per cent on bills paid the New Orleans Public Service, Inc., since September, 1922, was rendered by City Attorney Bertrand I. Cahn last week in response to a resolution offered in the Commission Council. Should the company be required to make the refund, the amount would range from $7,000,000 to $12,000,000, it was informally estimated. Mr. Cahn bases his finding on a statement that in 1918 the Commission Council agreed to let the New Orleans Railway & Light Company raise rates and fares 30 per cent until such time as a loan of $1,000,000 from the War Finance Corporation was repaid. It is said to have been repaid in September, 1922, and the contention is that rates should at that time have been reduced to the old figure.

STORMS DAMAGE ONTARIO TRANSMISSION LINES. — An electrical storm which broke over central Ontario on Aug. 3 did considerable damage to the lighting system of the city of Toronto, a large section of the municipality being without lights for many hours. The Carlaw Avenue substation was struck by lightning and a fire followed. More than 300 transformers throughout the city were blown out, interrupting the power on many lines. The emergency department of the Toronto Hydro-Electric system had one of the busiest nights in its history and every available lineman was on duty throughout the night. A short time before a storm had wrought considerable damage to the Hydro system at Woodstock, Ontario.

Coming Meetings

[A complete directory of electrical associations, with their secretaries, is published in the first issue of every volume. For latest list see issue for July 7, page 48.]

American Institute of Electrical Engineers — Pacific Coast convention, Spokane, Wash., Aug. 28-31. F. L. Hutchinson, 33 West 39th St., New York.

Pennsylvania Electric Association—Bedford Springs, Pa., Sept. 5-7. H. A. Buch, Telegraph Bldg., Harrisburg, Pa.

Maryland Utilities Association—Braddock Hotel, Braddock Heights, Md., Sept. 7. D. E. Kinnear, 1005 Continental Bldg., Baltimore.

Western Section, International Association of Electrical Inspectors—Cosmopolitan Hotel, Denver, Sept. 10-12. W. S. Boyd, 175 West Jackson Blvd., Chicago.

Illuminating Engineering Society—Toronto, Can., Sept. 17-20. L. H. Graves, 29 West 39th St., New York.

Rocky Mountain District, N.E.L.A.—Hotel Colorado, Glenwood Springs, Sept. 17-20. (With Colorado Utilities Association.) O. A. Weller, Public Service Co. of Colorado, Denver.

Empire State Gas and Electric Association—Saranac Inn, Upper Saranac, N. Y., Sept. 20-21. C. H. B. Chapin, Grand Central Terminal, New York.

American Electric Railway Association—Cleveland, Sept. 22-28. J. W. Welsh, 292 Madison Avenue, New York.

International Committee on Illumination, Saranac Inn, Lake Saranac, N. Y. Sept. 22-28. (See Illuminating Engineering Society.)

New England Section, N.E.L.A.—Poland Springs House, South Poland Springs, Me., Sept. 24-27. Miss O. A. Bursiel, Statler Bldg., Boston.

Great Lakes Section, N.E.L.A.—French Lick Springs, Ind., Sept. 27-29. R. V. Prather, 205 Illinois Mine Workers' Bldg., Springfield, Ill.

American Society of Mechanical Engineers—Boston, Oct. 1-3. C. W. Rice, 29 West 39th St., New York.

Association of Edison Illuminating Companies—Chamberlin-Vanderbilt Hotel, Old Point Comfort, Va., Oct. 1 to 5. P. S. Millar, East End Ave. and 80th St., New York.

National Safety Council—Hotel Pennsylvania, New York, Oct. 2-5. W. H. Cameron, 108 East Ohio Street, Chicago.

Southern Appalachian Power Conference—Atlanta, Oct. 8-10. W. A. Nelson, Charlottesville, Va.

American Welding Society—Philadelphia, Oct. 8-13. M. M. Kelly, 33 West 39th St., New York.

Eastern Association of Electrical Inspectors—Municipal Bldg., Springfield, Mass., Oct. 10-11. R. Walker, 85 John St., New York.

Kansas Section, N.E.L.A. — Wichita, Kan., Oct. 18-19. H. Lee Jones, 401 National Reserve Bldg., Topeka.

International Association of Municipal Electricians—Hotel Montelson, New Orleans, Oct. 22-26. H. N. Lang, Box 1864, Orlando, Fla.

Public Utilities Association of West Virginia—Hotel Pritchard, Huntington, Oct. 24-25. A Bliss McCrum, 514 Charleston National Bank Bldg., Charleston.

American Institute of Electrical Engineers — Regional meeting, Atlanta, Oct. 29-31. F. L. Hutchinson, 33 West 39th St., New York.

National Electrical Manufacturers' Association — Apparatus Division, Briarcliff Lodge, Briarcliff, N. Y., Oct. 29-Nov. 1. S. N. Clarkson, 420 Lexington Ave., New York.

PROJECTED HYDRO DEVELOPMENT ON SAC RIVER, MO.—Preliminary plans are reported to be under preparation for the construction of a power dam across Sac River, near Cobb, Mo., by the Ozark Utilities Company. A large tract of productive agricultural land along Sac River and Cedar Creek will be affected by the building of the dam. This will make twelve or thirteen hydro-electric projects in the Ozarks country, in southwest Missouri and northern Arkansas. Should they all be carried through, half a million horsepower will eventually be made available and many millions invested.

NEW VIRGINIA INTERCONNECTION WILL SOON BE MADE.—The Virginia Electric & Power Company has begun the work of extending its 66,000-volt transmission line from the present northern terminus at Quantico, Va., to a point in the vicinity of Occoquan where a substation will be built to permit an interconnection with the lines of the Virginia Public Service Company, which is building a line from a point near Alexandria to the point of interconnection. This will be the third interconnection between the two companies. In 1925 one was established at Roanoke Rapids, N. C., while in 1927 a further connection was made near Williamsburg, Va. The new line will be of the same standard as the present 66,000-volt line connecting Richmond, Fredericksburg and Quantico.

TURNERS FALLS-SPRINGFIELD HYDRO CONTRACT APPROVED.—The Massachusetts Department of Public Utilities has issued a finding approving a contract between the city of Springfield and the Turners Falls Power & Electric Company under the terms of which the latter agrees to purchase electricity derived from surplus water in the Cobble Mountain reservoir to be built by the city for the enlargement of its domestic water supply. The contract is for thirty years and the utility is to pay the city $270,000 per year for the use of the power. A new generating plant costing about $1,100,000 is to be built and leased to the Turners Falls company, and the facilities to be obtained represent the equivalent of a 23,000-kw. steam generating station, according to W. Rodman Peabody, vice-president of the power company.

INTERCONNECTION PROVES ITS VALUE IN KENTUCKY.—The Kentucky Utilities Company has called public attention to the vital importance of interconnection of power plants, as recently exemplified in Kentucky. On July 8 the company's plant at Pocket, Va., was seriously damaged by fire. Immediately two emergency stations, one at Dorchester, Va., and another at Varilla, Ky., which had been held for just such contingencies were placed in operation, and additional power was drawn from the Pineville (Ky.) steam plant and the Dix River and Kentucky River hydro plants, with the result that work in a

large coal-mining district went right ahead without interruption. If necessary, electricity could have been transmitted from Louisville and Lexington. A few days later heavy rains flooded the Varilla station, putting two of the mountain plants out of commission, and still there was no interruption.

ILLINOIS NORTHERN UTILITIES BUILDS LINE FROM DIXON AND BELVIDERE TO LEAF RIVER.—The Illinois Northern Utilities Company is constructing a 133-kv., double-pole, three-way transmission line to connect Dixon and Belvidere, Ill., with Leaf River, supplying energy from the Dixon hydro and steam plants. Aluminum-coated steel-core wire is used.

PROCEDURE IN CREATING SAN FRANCISCO PUBLIC UTILITIES COMMISSION QUESTIONED.—A suit has been filed to restrain Registrar Zemansky of San Francisco from any act that would permit a proposed charter amendment creating a city public utilities commission coming to a vote at the general primary election on Aug. 28. The suit is based on the contention that the Board of Supervisors failed to follow proper procedure when it voted to put the measure on the ballot. The assistant city attorney says that if the State Supreme Court finds the procedure irregular steps will be taken to have the proposed charter amendment placed on the November ballot instead.

SOUTHERN INDIANA GAS & ELECTRIC TO SERVE NEW COAL MINES.—Preliminary work on the construction of 47 miles of 32,000-volt transmission lines to provide power for new strip coal mines of the Electric Shovel Corporation of New York near Arthur, Ind., has been started by the Southern Indiana Gas & Electric Company, Evansville, according to Foley Roberts of the latter company. The project probably will consume 5,000,000 kw.-hr. annually, and the shovel company will be the electric company's largest customer. Transmission lines will start from the coming Ohio River station of the company and will extend east to Boonville and then north to the mine substation at Arthur. Completion of the project is expected this fall. For the present the lines will be served from the Division Street plant at Evansville.

CITY MANAGER OF CINCINNATI SEEKS TO ESTABLISH A NEW UTILITIES BUREAU.—First steps to establish a bureau for keeping track of the increases in capitalization of public utility corporations and for the employment of highly qualified experts for that purpose have been taken by C. O. Sherrill, city manager of Cincinnati, who says that whenever his city has been confronted with a demand for a new gas, electric or telephone rate it has been at a disadvantage because there has been no real information on file at the City Hall as to exactly what capital the companies really had invested in production for the benefit of customers.

Commission Rulings

WITHDRAWAL OF COMPLAINT NOT PERMITTED WHERE OTHER CONSUMERS ARE CONCERNED.—The Indiana Public Service Commission refused to allow certain petitioners to withdraw a complaint against rates of the Northern Indiana Power Company after they had reached an agreement with that company to make specified reductions. The commission held that there must be a hearing to permit other customers concerned to express their views and that the utility company must be called upon to file evidence supporting the reasonableness of the rate.

WISCONSIN MUNICIPALITY IS PROTECTED BY INDETERMINATE PERMIT THE SAME AS PRIVATE COMPANY.—At the time the Wisconsin indeterminate franchise law was passed, the city of Plymouth in its private capacity was supplying energy to the town of Plymouth. The Wisconsin Gas & Electric Company recently attempted to enter that territory, and the question arose whether a utility which was already a municipality could possess an indeterminate permit. The Wisconsin Railroad Commission has decided that a city plant functioning beyond its limits is on the same footing as a private company and is, therefore, entitled to all the protection of such a permit.

REGULATION OF TRANSMISSION ACROSS STATE BOUNDARIES.—Basing its argument on the decision of the United States Supreme Court in the Narragansett Electric Lighting-Attleboro Steam & Electric case, in which it was held that a state cannot regulate the rate charged by a local electric corporation for energy sold to a foreign corporation for use in another state and delivered at the boundary, the Arizona Edison Company claimed that a decision made by the California Railroad Commission in 1920 increasing the rates paid under contract by the Arizona company to the Southern Sierras Power Company exceeded the commission's jurisdiction and laid a direct burden upon interstate commerce. In denying the complainant's request that the contract rates of 1917 be substituted, the California commission observed: "The complainant's whole case is premised on the assumption that by the force of the Attleboro decision the previous orders of this commission in regulating the rates in question are illegal and void. Though the facts surrounding the interstate transmission and sale of power by the complainant to defendant may be similar to those in the Attleboro case, we are not prepared to say that the two cases are parallel, and we are therefore not justified in concluding that the rates fixed by this commission covering the sale of electric current by the defendant to the complainant are void and of no force and effect. Should it be admitted that by the force of the Attleboro decision this commission must now acknowledge that the rates fixed in its decision were illegal, such admission would not aid the complainant herein. This commission is asked to issue its order declaring the rates previously fixed by it to be illegal and void because this commission had no power to fix such rates and at the same time it is asked to order certain other rates to be reinstated. There is no allegation that the present rates are unjust, unreasonable or discriminatory, nor is there any allegation that the rates mentioned in the private contract of March 15, 1917, are just and reasonable. It does not matter that the other rates were rates agreed upon in a private contract between the parties. To declare such rates effective would be just as much a regulation of the rates of defendant, and just as much an imposition of a burden on interstate commerce, as would have been the fixing of rates in our earlier order." A refund of the difference between the private-contract rates and those fixed by the commission was also asked by the Arizona Edison Company and likewise refused.

Recent Court Decisions

LEGALITY OF CITY COUNCIL'S AWARDING CONTRACT FOR MUNICIPAL PLANT TO SOLITARY BIDDER.—The City Council of Sargent, Neb., having only one bidder before it —Fairbanks, Morse & Company—awarded to this company a contract for the construction of a municipal electric plant without a popular vote, and certain citizens held its action to be illegal and appealed to the District Court to interfere. This court has upheld the Council, and an appeal is now to be taken to the Nebraska Supreme Court.

REFUND DUE CUSTOMER ON PAYMENT FOR BUILDING LINE CANNOT BE CHARGED BY HIM AGAINST AMOUNT HE OWES FOR ENERGY.—An action brought against the Broad River Power Company by S. J. Barrett because of discontinuance of service and won by the plaintiff in the trial court was appealed to the Supreme Court of South Carolina, which reversed the finding. The Supreme Court held that an electric company has a right to discontinue its service to a customer on his non-payment of recent and just bills for service and also the right to refuse a further supply of electricity until the bills are paid. The court denied the right claimed by the customer to set off against the bills due the amount paid by him, under a refund agreement, for construction of a line to his premises. The two transactions, it held, were separate and distinct. (143 S. E. 650.)*

DEATH OF WASHING-MACHINE OPERATOR FROM SHOCK PRIMA FACIE CASE AGAINST COMPANY FURNISHING POWER.—Ramsey vs. Carolina-Tennessee Power Company et al. was a suit for damages because of the death of a man in charge of a washing machine operated by electricity furnished by the company. Evidence was that the man killed observed the motor to be smoking and took hold of the switch, being instantly killed, and that the reason for the fatality was a short circuit caused by railroad cars running off a track and striking a pole carrying the electric company's wires, which in consequence became crossed. The other defendants were the laundry company by which the victim was employed and the railroad company. The Supreme Court of North Carolina sustained a nonsuit in favor of the laundry company and a finding against the electric company and the railroad, on the ground that one was negligent in erecting the pole on the railroad's right-of-way and the other in allowing it to be done. A prima facie case was held to exist. (143 S. E. 861.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

News About Men of the Industry

New Officers Elected for Cortland County Traction

G. H. Garrison, vice-president and general manager of the Cortland County Traction Company, Cortland, N. Y., was elected president of the company on Aug. 4 by the board of directors. The Cortland County Traction Company, which supplies light and power, is now part of the Mohawk-Hudson system. Mr. Garrison's election fills the vacancy made by the death, July 4, of President Edwin Duffy.

C. H. Churchill was elected vice-president and general manager. J. D. Whittemore vice-president, Albert Haskell, Jr., secretary (re-elected), and P. D. Weathers treasurer. Mr. Churchill has been general manager of the Port Henry Light, Heat & Power Company of Port Henry, a subsidiary of the New York Power & Light Corporation. He will take up his new duties in Cortland this month. Mr. Whittemore is executive engineer of New York Power & Light Corporation, with offices in Albany. Mr. Weathers is treasurer of the Mohawk-Hudson Power Corporation and of the New York Power & Light Corporation.

C. E. MURPHY, former sales manager of the Sioux City Gas & Electric Company, has been promoted to the newly created position of general sales engineer of the Iowa Public Service Company and the Sioux City Gas & Electric Company. VICTOR O. STAFFORD of Waterloo, Iowa, has been named sales manager of the Gas & Electric Company in charge of all merchandise sales. C. R. TRACEY has gone to Sioux City from New York to fill a newly created post of illumination engineer of the Gas & Electric Company.

MAJOR GLENN E. EDGERTON, chief engineer of the Federal Power Commission, has been made a member of the Board of Engineers for Rivers and Harbors. He will fill that place in addition to his other duties. This is a step looking to the co-ordination of navigation and power development so that the possibilities of power development may be considered in connection with navigation improvements and likewise so that the issuance of federal rights for water-power development may fit into plans for river work.

G. H. WYGANT has recently been made sales manager for the Electrical Supply Company of New Orleans. Prior to this connection Mr. Wygant was manager of the wholesale electrical business of the Knight & Wall Company of Tampa, Fla., where he served for four years, having previously been for five years in the wholesale electrical jobbing business in New Orleans. Mr. Wygant also was employed with the Stone & Webster interests for twelve years in the capacity of manager of the Baton Rouge (La.) Electric Company and as commercial manager of the Tampa (Fla.) Electric Company. Hence he is well known to the electrical jobbing, contractor-dealer and central-station interests throughout the entire district.

C. S. MacCalla President of East Central Association

Clifford S. MacCalla, newly elected president of the East Central Division, National Electric Light Association, is vice-president of the Penn-Ohio Edison Company, vice-president and general manager of the Pennsylvania-Ohio Power & Light Company, Youngstown,

C. S. MacCalla

Ohio, and president and general manager of the Pennsylvania Power Company, the Youngstown Municipal Railway Company, the Pennsylvania-Ohio Coach Lines Company and associated electric service and transportation companies of the Penn-Ohio System. He has had wide and varied experience in various parts of the United States and abroad in electrical construction and manufacture as well as in utility operation. His early service in the utility field was with the Philadelphia Bell Telephone System and the Edison Electric Light Company of Philadelphia, now the Philadelphia Electric Company. Four years were then spent with the Edison Electric Illuminating Company, Brooklyn, N. Y., now the Brooklyn Edison Company, where he laid a foundation of practical electrical work.

From Brooklyn Mr. MacCalla went to the foreign department of the General Electric Company as principal assistant engineer in charge of the installation of the tramway lines in Sydney, Australia, for the New South Wales government. In 1903 Mr. MacCalla transferred his interests to the Washington Water Power Company, Spokane, Wash., as assistant to the general manager. He was promoted successively to the posts of assistant general manager, general manager and vice-president and general manager. Leaving Spokane in 1918, Mr. MacCalla returned to the East and devoted two years to electrical manufacture, becoming works manager of the Rochester plant of the General Electric Company. In 1920 he was elected vice-president and general manager of the Virginian Power Company, Charleston, W. Va.

Mr. MacCalla removed to Youngstown, Ohio, in the fall of 1923 to become vice-president and general manager of the Pennsylvania-Ohio Power & Light Company and president and general manager of associated companies. He is a fellow of the American Institute of Electrical Engineers and a member of the American Society of Civil Engineers. He had served two years as a vice-president of the East Central Division, N.E.L.A.

Obituary

ERNEST L. COOLEY, hydraulic engineer and inventor of the "bear-trap dam" used in the Genesee River at Rochester, N. Y., died at Canandaigua, N. Y., on Aug. 3. He received a gold medal at the Paris Exposition of 1903 for his design. For thirty years he was employed by the Sanitary District of Chicago.

JAMES F. MCLAUGHLIN, formerly chief for more than twelve years of the Municipal Electric Bureau of Philadelphia, died at his home in that city on Aug. 4 at the age of 66. He was well known as an engineer and inventor and had the credit both for improvements in the city's police and fire electrical communication systems and for helping to modernize the street-lighting system. His terms of office were from 1907 to 1912 and from 1916 to 1923.

WAYLAND LLOYD ARNOLD, widely known in the electric and public utility field, died suddenly from a heart attack at his home in Chicago on July 28, after recovery from an attack of pneumonia. He was born in Jackson, Mich., in 1863 and grew up in Nebraska. In 1890 he joined the Thomson-Houston Electric Company, remaining with the General Electric Company after the consolidation. For a number of years he was in charge of that company's St. Louis office, after which he became connected with the Arnold Engineering Company, Chicago, remaining as vice-president until 1926, when he retired from active business. In the meantime he had also become vice-president of the Elgin & Belvidere Electric Railway Company. He had traveled in many countries.

Financial and Statistical News

Bond Issues Withheld Markets Still Soft

BENEFICIAL results upon the bond market of the policy of postponement of new issues, adopted by investment bankers to relieve and prevent congestion, are not yet definitely evident. Many of the retailing houses have a supply of bonds in excess of current demand. This, in conjunction with a degree of liquidation, has the effect of softening prices, and the remedy, so far, at least, is less effective than was anticipated.

Part of the reason is undoubtedly to be found in the large increase in stock financing which has taken place. Taking all classes of financing for July, total bond sales fell short of $200,000,000, while stock sales exceeded $432,000,000. In the power and light industry alone bond offerings declined to less than $5,000,000, while the issue of stock entirely in the form of rights exceeds $28,000,000. The capital market is constantly absorbing large quantities of these stock issues in the form both of rights and of customer sales, and the effect of this naturally is felt at a time when there appears to be a surplus of investment securities still in the market.

The stock markets continue lethargic. Utility issues are mantaining their position as creditably as any other single group, if not more so, but prices are still far below the levels of three months ago.

Power and Light Industry has Unlimited Possibilities

Discussing the future possibilities of the power and light industry in their eighth edition of "Public Utility Points," Bonbright & Company state that the field for future development is so great that capital investment is expected to increase by nearly one-third and gross receipts by more than one-half during the next five years alone. This forecast is based on the following considerations:

1. More than one-third of the population of the United States still lives in unwired homes.
2. More than half of the homes wired for electricity are still without any domestic electric appliance except the flatiron. The average home today consumes only 400 kilowatt hours a year; it would need from ten to twenty times as much electricity if completely equipped with electric servants.
3. More than 90 per cent of the farms in the country are not yet being served by the power and light companies.
4. Only half of our requirements for power in industry is supplied by the power and light companies.
5. Of our total railroad mileage only about 1 per cent is electrified.
6. The lighting of the country's great network of highways and of the rapidly increasing number of airways has only just begun.
7. The advent of radio broadcasting and of the radio outfit supplied with electricity from the lamp socket has opened up a new field for consumption of current.

American Water Works Earnings Up 6 per Cent

Showing an advance of almost 6 per cent for the twelve months ended June 30, American Water Works and Electric reports gross earnings of $49,863,070 against $47,154,666 for the year ended June 30, 1927. The consolidated net income, after all charges including reserves for renewals, retirements and depletion for the year just ended, was $5,111,104. This is equivalent after accrued first preferred dividends to $2.82 a share on the 1,395,436 shares of common stock outstanding at June 30. For the first six months of the year power output of the electric subsidiaries was 863,227,414 kw.-hr., against 833,453,111 kw.-hr. for the corresponding period last year.

Middle West Utilities Sells $30,000,000 Short-Term Issue

The midsummer vacation in financing was broken this week in the offering of a $30,000,000 short-term serial issue by the Middle West Utilities Company. This is the first utility issue of magnitude to be sold for some weeks. The issue is made up of three $10,000,000 series bearing a 5½ per cent coupon, maturities being one, two and three years. These notes, the company announces, will be refunded by sale of additional common stock.

The purpose of the issue is largely to reimburse the parent company for expenditures incurred in the development of subsidiaries. The new issue is a direct obligation of the company and constitutes the only funded debt. The notes are followed by the company's various stock issues listed on the Chicago Stock Exchange, which have a combined market value, based on recent quotations, of more than $190,000,000.

The Middle West Utilities and its subsidiaries, as of June 30, 1928, had approximately 250,000 stockholders throughout the country.

Benefits of Consolidation Illustrated

Illinois Power & Light Corporation Establishes Large Super-Power System—Numerous Economies Shown to Result

CONSOLIDATING a group of independent operating utilities into a super-power system in a progressive area of the Middle West, southwest of Chicago, the Illinois Power & Light Corporation well illustrates the economies of concentration in the power field. In the past two years the corporation has built many hundred miles of additional high-tension transmission lines and is acquiring a quarter interest in Super-Power Company of Illinois, intending to take about 25 per cent of the output of that company's new generating plant being built at Powerton, Ill.

On the ground that it is more economical, Illinois Power & Light Corporation has chosen to increase its interconnecting transmission lines and power purchase contracts rather than to construct new generating plants. Careful investigation has demonstrated that the best operation is obtained where plants of great capacity have been built in favorable locations with regard to fuel and water. Such a policy is working out decidedly well in this case.

Steady Growth in Earnings

From a total of $26,480,318 in 1923, combined gross earnings of the system had increased by 1927 to $31,742,460. Operating costs have been hewn steadily during the period, with the result that the operating ratio has been cut down from 65.2 per cent in 1923 to 60.3 per cent last year. The greatest growth was in the electrical field, where gross earnings expanded from $11,940,968 in 1923 to $17,224,224 last year.

Total assets of the corporation at the end of 1927 amounted to $201,303,906, of which fixed capital, most of which is property, accounted for $175,452,557. The property investment of the system figures out to about $5.62 per dollar of gross revenue. The corporation's balance sheet as of Dec. 31 last showed funded debt to a book value of $115,623,800, preferred stock of $44,768,700 and common stock of $22,060,104.

Last year's financial operations included refinancing, where practicable, of bonds of high interest rates by the issuance of lower rate securities and a small amount of new financing. Customer sales promotion was also continued by the parent company and by the Iowa Power & Light Company and the Kansas Power & Light Company.

Relative to the distribution of manufactured products, the corporation points out that merchandising activities and sales of appliances created a new high record in 1927 and have continued to make new records so far in 1928. Naturally this increased activity

in equipment merchandising is of double benefit. It not only increases revenue through sales but results also in a larger market for the corporation's services.

International Paper Company Increases Power Holdings

International Paper Company's 913,100 hp. of electric energy developed or under construction illustrates the rapid progress the company is making in the power field. Of this total, nearly half, or 436,000 hp., is on the Gatineau River in the Province of Quebec. The company has hydro-electric developments also at Faugun, Quebec; Grand Falls, N. B.; Kent Falls, N. Y., and in Newfoundland, etc.

The New England Power Association, which will shortly become part of the International Paper & Power Company, the holding company which is to take over the International Paper Company, has eleven hydro and six steam plants in operation and distributes more than a billion kilowatt-hours of electric energy annually.

Railway Electrification Progressing Steadily in Germany

One of the three lectures delivered at the recent annual meeting of the Association of German Electrical Engineers in Berlin concerned the electrification of the German railways, including the recently electrified Berlin City & Suburban Railways. At the end of 1914 only 200 km. of line were electrified in Germany. This had risen to 400 km. by 1921, 500 km. by 1922 and 970 km. by 1925. Electrified lines now comprise 1,550 km., which is, however, only about 3 per cent of the total length of German railways. The annual consumption of traction current has increased from 25,000,000 units in 1914 to 250,000,000 in 1927.

Electrification in Germany is chiefly confined to four networks. The largest of these, 700 km., is in Bavaria, extending from Munich to Regensburg, and in a southerly direction to Mittenwald, to Kufstein and to Salzburg and Berchtesgarten, as well as branches from these main lines. The second largest in point of length is the Silesia mountain railway from Breslau via Hirschberg to Gorlitz. The length of this network is 350 km. A distance of 200 km. from Halle to Leipzig and Magdeburg is also electrified. The third largest network, 240 km., is the Berlin City & Suburban Railways. This operation requires 419 electric locomotives and 726 motor coaches. A further 2,575 km. are marked out for electrification as soon as the necessary capital is available. Equipment and operating costs, which have already been calculated, are so high that they will have to be spread over a number of years.

The sections for which electrification is projected during the next few years are: Oppeln, Brieg, Breslau, Liegnitz, Gorlitz, 385 km. (later to be extended to Dresden and Regensburg); Munich-Karlsruhe (with a branch to Heilbronn), 455 km. (later to be extended to Erfurt from Heilbronn); Munich, Nuremburg, Halle, Berlin-Magdeburg and Leipzig to Erfurt, 995 km. (the Leipzig-Erfurt line to be extended later to Frankfurt-on-the-Main); Frankfurt-on-the-Main to Basle, 620 km., and Cologne, Dusseldorf, Dulsburg, Dort-

Stock Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Tuesday Aug. 7	Low 1928	High 1928
ABITIBI PWR. & PAPER, com.			
$4—no par	48¼	47	85
Ala. Pwr., $7 cum. pf.—no par	114	114¼	115½
Allis Chalmers Mfg., 7% com.	126	115¼	129½
Aluminum Co. of Amer., com.	135	120	197½
Aluminum Co. of Amer., 6% pf.	107½	105½	110½
Amer. & Foreign Pwr.7%pf.—no par	107½	104½	110
Amer. & Foreign Pwr., com.—no par	33¼	22½	38½
Amer. Bosch Magneto, com.—no par	32	15½	41
Amer. Brown Boveri Elec.†	13¼	10½	26½
Amer. Brown Boveri Elec., pf. $7	50½	40½	65½
Amer. Gas & Elec., 6% pf.—no par	106	104½	111
Amer. Gas & Elec. com. $1—no par	170	117½	184
Amer. Lt. & Trac., 6% pf.	118	116	120
Amer. Lt. & Trac., 8% com.	217½	170	249
Amer. Pwr. & Lt., 6% pf.	m102	102	107½
Amer. Pwr. & Lt., com.†—no par	79½	62½	95
Amer. Pub. Serv., 7% pf.	a 99	97½	104
Amer. Pub. Serv., com.†	m 60	...	...
Amer. Public Utilities, 7% ptc. pf.	m 90	90	101
Amer. Public Utilities, 7% pr. pf.	a102	93½	101
Amer. Public Utilities, com.	m 50	...	...
Amer. States Sec., A	a 10½	4	13½
Amer. States Sec., B	a 14	4½	17½
Amer. Superpower, 6% 1st pf.	98	...	...
Amer.Superpower, Class A†—no par	35	33½	56
Amer. Superpower, Class B†—no par	35½	35½	56½
Amer.Wtr.Wks. & Elec., 6% pf.	m100	100	106
Amer. W. W. & E., $1 com.—no par.	56	52	70
Anaconda Copper cap. $4	66½	53½	74½
Appalachian Electric Pwr., 7% pf.	109	105	110½
Arkansas Pwr. & Lt., 7% pf.	106	105	109
Assoc. Gas & Elec., $3.50—50	52½	...	...½
Assoc. Gas & Elec., pf.—$6—no par—ex. div.	96	96	98½
Assoc. G. & E., Class A, 10—no par.	48½	47	52½
BABCOCK & WILCOX, 7% com.	120	118	127
Binghamton L., H. & P., $6 pf.	10)	102	109½
Birmingham Elec., pf.—6%—no par.	m108	104	107
Blackstone Valley G. & E., 6% pf.	m108	106	112
Blackstone Valley Gas & Elec., 10% com.—50	m165	135	170
Blaw-Knox com. $3	¢103	91	108
Brazilian Trac., Lt. & Pwr.,com., 1.76	f52½	...	...
Broad River Pwr., 7% pf.	105	105	108½
Brooklyn Edison, 8% com.	237	206½	268½
Buffalo, Niagara & East. Pwr., $1.60 pf.—25	l 26½	...	...
Buffalo, Niagara & East. Pwr. com. $1.20—no par	45	...	...
CALIFORNIA ELEC. GENERATING, 6% pf.	99	98	101
Carolina Pwr. & Lt., pf.—$7—no par	109	109	111
Central & S. W. Util., $7 pf.—no par	m100	99½	105½
Central & S. W. Util., pr. ln. $7 pf.—no par	m102	102	112
Central Ark. Ry. & Lt., 7% pf.	m102	105	107½
Central Ill. Pub. Serv., $6 pf.	a 97½	97½	100½
Central Ind. Pwr., 7% pf.	m100	95	101½
Central Maine Power, 6% pf.	97	96	98½
Central Maine Power, 7%	110	104½	121½
Central Pwr. & Lt., 7% pf.	104	104	114
Central States Elec., 7% pf.	115	104½	121½
Century Electric com.	n130	130	145
Cincinnati Gas & Elec., 5% com.	m 99	97½	100½
Cities Service, $6 pf.—no par.	99½	94½	103½
Cities Service, pf. B—no par.	l 9½	8½	9½
Cities Service, pf. BB—no par.	l 94	88½	97
Cities Service, com.—20	65½	54	70½
Cities Service, Bks. Shrs.—10	l 32½	26½	35½
Cities Service Pwr. & Lt., 7% pf.	107½	106	109½
Cities Service Pwr. & Lt., 6% pf.	99½	95	102
Cleveland Elec. Illg., 6% pf.	109	109	115½
Cleveland Elec. Illg., 10% com.	425	350	425
Columbia Gas & Elec., 6% pf.	107½	106	110½
Columbia G. & E. com. $5—no par.	111½	89½	118½
Columbus Elec. & Pwr., 7%	110	...	...
Columbus Ry., Pwr. & Lt., 6% pf.	103	107	111
Columbus Ry., Pwr. & Lt., 6½% pf. B.	102	105	111
Columbus Ry., P. & Lt., com. no par	125	120	125
Commonwealth Edison, 8% com	184½	165	189
Commonwealth Pwr., 6% pf.	n 99	100	104½
Commonw'th Pwr., $3, com.—no par	97½	62½	87½
Conn. Lt. & Pwr., 8% pf.	117	120	123
Conn. Lt. & Pwr., 7% pf.	116	118	121
Cons. Gas of N. Y., $5 pf.	100½	100½	105
Cons. Gas of N. Y., com. $5—no par	144	119½	170½
Cons. Gas, Elec. Lt. & Pwr. of Baltimore, 6% pf.	m105	109½	114½
Cons. Gas, Elec. Lt. & Pwr. of Baltimore, 5% Pf.	m101	100	105½
Cons. Gas, Elec. Lt. & Pwr. of Baltimore, com. $3.00—no par.	e 80½	67½	93
Consolidated Power & Lt., 7% pf.	105	106	109
Consumers Power, 6% pf.	103½	104	106½
Consumers Power, 6.6% pf.	104	104	108½
Continental Gas & Elec., 7% pr. pf.	105½	105	108½
Conti. G. & E. com. $4.40—no par.	m225	240	265
Cocker Wheeler, com.†	80	23	85
Crocker Wheeler, 7% pf.	97	77	100
DALLAS PWR. & LT., 6% pf	m109	110	111½
Dayton Pwr. & Lt., 6% pf.	107½	107	110½
Derby Gas & Elec., 7% pf.	98	96	100½
Detroit Edison, 8% com.	197	166½	209
Dubilier Condenser, com.—no par.	2½	2½	5½
Duke Pwr., 4% com.	137	130	148½
Duquesne Lt., 5% pf.	100½	100½	105½
EASTERN NEW YORK UTIL., $7 pf.	m110	111	112½
Eastern States Pwr. B	m 18	12	24
Eastern States Pwr., pf.	m100½	98	100½
East. Tex. Elec., 7% pf.	107	106	109
Edison Elec. of Boston, $12 com.	d278	252	305
El Paso Elec. 7% pf.	m111½	110	112½
Elec. Bond & Share, 6% pf.	j108½	108½	111½
Elec. Bd. & Sh. Sec., com. $1—no par	98½	76	127½
Electric Household Util.†	25½	13½	27
Elec. Investors, 6% pf.—no par.	96	101	104½
Elec. Investors, com.†— no par.	61½	40½	79½
Elec. Pwr. & Lt., ctfs. 7% pf.	107½	106½	110½
Elec. Pwr. & Lt., ctfs., com.—no par.	34½	28½	45½
Elec. Ry. Securities, com.—no par.	6½	...	...
Elec. St. Battery com. $5.25—no par	78½	69	84½
Elmira Wtr., Lt. & R.R., 7% pf.	105	104	115
Empire Pwr., ptc., $2	32	27½	39½
Engr. Pub. Serv. $5, pf.—no par.	m 97	97	102
Engr. Pub. Serv., com.—no par.	38	33	46½
Eureka Vacuum Cleaner, com. $4—no par.	m 60	60	70
FAIRBANKS MORSE, 7% pf.	m112	104	114½
F.-M., com.—$3—no par	45½	32½	54
Federal Lt. & Trac., com. $1.40.	m 51½	42	56½
Federal Lt. & Trac., $6 pf.—no par.	m102½	98	109
Florida Pwr. & Lt., 7% pf.	m102	103	108
Ft. Worth Pwr. & Lt., 7% pf., ex.div.	113	113	114½
GALVESTON-HOUSTON ELEC. 6% pf.	77	75	85
Galveston-Houston Elec., com.	33	31	34
General Cable, Cl. A	76	56	84½
Gen. Elec. $4 com.—no par.	151½	124	174½
Gen. Elec., special—6%	11½	11½	11½
Gen. Gas & Elec. (Del.), com. A $1.50 no par.	57½	35½	56½
Gen. G. & E. (Del.) pf. A. $8—no par	135	125	144
Gen. G. & E. (Del.) pf. A $7—no par	118	110	120
Gen. G. & E. (Del.) pf. B $7.	114	104	117
Gen. Pub. Serv., $7 pf.	98	98	140
Gen. Pub. Serv., com., no par.	23½	16½	29
General Public Utilities, $7 pf.	m 95	98	103
Ga. Lt., Pwr. & Rys., com.	m 58	55	65
Gt. Western Pwr., 7% pf.	105	...	...
IDAHO PWR., 7% pf.	109	109	111½
Ill. No. Utilities, 6% pf.	a100	98½	101
Ill. Pwr. & Lt., $6 pf.	106½	103	107
Indianapolis Pwr. & Lt., 6½% pf.	m103½	102	107½
Indianapolis Pwr. & Lt., $7 pf.	m 99	99	105
Ingersoll Rand com. $3	92½	90	98
Int. Combus. Engr., com.$2—no par	61½	45½	72½
Int. Combustion Engr., 7% pf.	103½	103	109
Int. Util., Class A—$3.50—no par	44½	44½	52
Int. Utilities, Class B—no par.	15	6½	19½
Interstate Pwr., pf.—$7—no par.	97½	97½	105
Interstate Pub. Serv., 7% pf.	106	103	108
Iowa Ry. & Lt., 7% pf.	m101	101	103
JERSEY CENTRAL PWR. & LT. CO., 7% pf.	103	103	107
Johns-Manville. com. $3— no par.	126½	96½	134

Stock Exchange: *a*Chicago; *b*St. Louis; *c*Philadelphia; *d*Boston; *e*Baltimore; *f*Montreal; *g*Cincinnati; *h*San Francisco; *i*Pittsburgh; *j*Washington; *k*Cleveland. *l*Bid price Saturday, Aug. 4. *m*Bid price Wednesday, Aug. 8. *n*Latest quotation available. †Dividend rate variable.

Stock Quotations of Electric Light and Power and Manufacturing Companies (Continued)

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Tuesday Aug. 7	Low 1928	High 1928
KANSAS CITY POWER & LIGHT $6 pf.	*m*108	108	114
Kansas Gas & Elec. 7% pf.	109	107	110
Kelvinator Corp.	9½	7½	22½
Kentucky Hydro-Elec., 7% pf.	*m*103	100	105
Kentucky Sec., 6% pf.	90	90	98
Kentucky Sec., 5% com.	150	140	150
Kentucky Utilities, 6% pf.	105	100	105
LACLEDE GAS LT., 10% com.	*m*210	200	260
Long Island Ltg., 7% pf	*m*108½	108½	112½
Long Island Ltg., 6% pf.	*m*102	104	109
Long Island Ltg., com. $3—no par.	*m*250	170	250
Los Angeles Gas & Elec., 6% pf.	106½	105½	112½
Louisville Gas & Elec., cl. A. $1.75.	34½	28	41
MAN. ELEC. SUPPLY, cap. $5— no par	60	50	66½
Maytag Co., com. $1.50—no par.	18	18	22
Memphis P. & L., pf.—$7—no par.	*m*107	107	111
Metropolitan Ed., pf.—$6—no par.	103½	103	109½
Metropolitan Ed., pf.—$7—no par.	108½	108½	111½
Metropolitan Ed., com. $8—no par.	*m*160	125	185
Middle West Utilities, 6% pf.	*a* 97½	93½	100½
Middle West Util., 6% pr lien	100	99	108
Middle West Util., com. $7—no par	155	123½	169
Midland Utilities, pr. in. 6% pf.	*m* 90	90	97
Midland Utilities, 7% pf. A.	*m* 98	98	105½
Milwaukee Elec. Ry. & Lt., 7% pf.	105	100	106
Milwaukee Elec. Ry. & Lt., 6% pf.	100	98	110
Minn. Pwr. & Lt., 7% pf.	*m*108	107	109
Miss. River Pwr., 6% pf.	107	94	112½
Mohawk Hudson Pwr., 1st pf.—$7 —no par	*m*1 8	100	110
Mohawk Hudson Pwr., 2d pf.—$7 —no par	*m*102	100	109
Mohawk Hudson Pwr., com.—no par	37½	29½	53
Montana Pwr., 6% com.	*m*147	102½	175
Montreal Lt., Ht., & Pwr. com. $2 —no par	*f*101	....	....
Mountain States Pwr., 7% pf.	*m*101	97	105
Mountain States Pwr., com.†	17	....	....
NASSAU & SUFFOLK LTG., 7% pf.	109	98	110½
National Carbon, 8% pf.	*n*136	136	139½
National Elec. Pwr., A†	*e*34½	27½	42
National Pwr. & Lt., pf. 7%	108½	106½	111
National Pwr. & Lt., com.†—no par.	32½	21½	36½
National Pub. Serv., 7% pf.	99	99	104
National Pub. Serv., A com. $1.60— no par	24½	22	29½
National Pub. Serv., B com.—no par	*n* 30½	24½	32½
Nebraska Pwr., 7% pf.	*f*109	110	111½
Nevada-Calif. Elec., com.	*n* 53	33½	53
New Brunswick Pwr., 4% pf.	*m* 60	60	70
New Eng. Pub. Serv., pf. $6	110	98½	110½
New Eng. Pub. Serv., pf. $7	*m* 105	95	108
New Orleans Pub. Serv.—7% pf.	107	106	110
N. Y. & Queens Elec. Lt. & Pwr., 5% pf.	102	91	104
N. Y. Central Elec., 7% pf.	*m*100	100	107
New York Power & Light 7% pf.	112	....	....
No. Amer., 6% pf.—50.	54	53½	55½
No. Amer., com.—10	71	58½	78½
No. Amer. Edison, $6 pf.—no par	101½	100½	105½
Northeastern Pwr., com. $1	25½	19½	31
No. N. Y. Utilities, 7% pf.	107	103	109
No. Ohio Pwr., com.—no par	27½	18	32
Northern Ohio Pwr. & Lt., 6% pf.	100	90	100
No. Ont. Lt. & Pr. 6% pf.	*m* 98	94	100
No. States Pwr. (Del.), 7% pf.	109	108½	110½
No. States Pwr. (Del.), 8% com.	134½	123	152
No. Texas Elec., 6% pf.	50	45	70
No. Texas Elec., com.	14	....	....
OHIO BRASS, com. B $5—no par.	90	90	100½
Ohio Brass, 6% pf.	*m*104	104	111
Ohio Pwr., 6% pf.	108	104	109½
Ohio Pub. Serv., $6 pf.	104	95	105
Ohio Pub. Serv., 7% pf.	112	107	112
Ohio River Edison, 7% pf.	107½	106	109½
Oklahoma Gas & Elec., 7% pf.	110½	106	115½
PACIFIC GAS & ELEC., 6% pf.	*m*26½	26½	30
Pacific Gas & Elec., $2 com.	47	43½	53½
Pacific Pwr. & Lt., 7% pf.	109	106	110
Packard Electric, com. $2.80	85	47	85
Penn Cent. Lt. & Pwr., $5 pf.—no par	*m* 77	77	82
Penn-Ohio Edison, $6 pf. no par.	*m* 95	92	101
Penn-Ohio Edison, 7% pf.	108	104½	109
Penn-Ohio Pwr. & Lt., 7% pf.	109½	....	....
Penn Pwr. & Lt.—$7—no par.	109	109	110½
Penn Wtr. & Pwr., $2.50 com., new	*e* 80	68	80
Phila. Co., 5% pf.—50.	*m* 47	45½	48½
Phila. Co., 6% pf.—50.	52½	52	57
Phila. Co., $4 com.—50.	*m*160	145	174½
Phila. Elec., $2 com.—25.	*c* 65½	55½	74½
Portland Elec. Pwr., 7% pf.	104	100	106
Portland Elec. Pwr., 6% pf.	93	78	96
Portland Elec. Pwr., 6% 2d pf.	83	55	88
Portland Elec. Pwr., com.	43	....	....
Potomac Elec. Power, 6% pf.	*j*111½	....	....
Pwr. Sec., pf.—no par.	60	50	68
Public Serv. of Colorado, 7% pf.	107	....	....
Pub. Serv. of N. J., 6% pf.	*m*106	103½	115
Pub. Serv. of N. J., 7% pf.	125	118	129½
Pub. Serv. of N. J., $2 com.—no par	55½	41½	66½
Pub. Serv. of No. Ill., 6% pf.	124½	110	120½
P. S. of No. Ill., com. $8—no par.	*m*125	125	190½
Pub. Serv. of No. Ill., $8 com.	*a*186	139½	190
Pub. Serv. of Okla., 7% pr. in.	109	100	107
Pub. Serv. Elec. & Gas, 6% pf.	107	107	110½
Puget Sound Pwr. & Lt., 7% pf.	*m*110	105	110
Puget Sound Pwr. & Lt., 6% pf.—no par.	98½	92	105½
Puget Sound Pwr. & Lt., com.	80½	34½	94½
RADIO CORP. OF AMER., $3.50 pf.—50.	55½	54½	60
Radio Corp. of Amer., com.—no par.	171	85½	224
Rochester Gas & Elec. 6% pf. D.	105½	105½	106½
Rochester Gas & Elec., 7% pf. B.	107	105	108
Rochester Gas & Elec., 6% pf. C.	104	105½	106½
SAN JOAQUIN Lt. & Pwr., 7% pr. pf.	117	110	117½
St. Joseph Ry., L., H. & P., 5% pf.	*m* 75	70	75
Servel, Inc.	15½	4½	17½
Shawinigan Water & Power, com., $2 no par	*f* 90	....	....
Sierra Pacific Elec., 2% com.	*m* 45	29	49½
Sioux City Gas & Elec., 7% pf.	104½	100	108½
Southeastern Pwr. & Lt., pf.—$7 no par.	*j*107½	....	....
Southeastern Pwr. & Lt., pfc. pf., $4	87½	....	....
Southeastern Pwr. & Lt., $1 com. —no par.	48½	40½	61
So. Calif. Edison, 8% pf.	49	43½	53½
So. Calif. Edison, 7% pf.	29	27½	29½
So. Calif. Edison, 6% pf.	27	25½	28
So. Calif. Edison, $2 com.	46½	43½	53½
Southern Cities Utilities, 7% pf.	83	75	92
Southwestern Lt. & Pwr., A $3.	65	60	80
Southwestern Lt. & Pwr., B	50	....	....
Southwestern Lt. & Pwr., $6 pf.	89	....	....
Southwestern Pwr. & Lt., 7% pf.	*m*110	103	115
Standard Gas & Elec., 8% pf.	66½	65	71½
Standard Gas & Elec., 7% pr. pf.	110	108	115
Standard G. & E., com. $3.50.	63½	57½	74½
Standard Power & Light, com.	*m* 47	29½	58½
Standard Pwr. & Lt., 7% pf.	*m*102	98	106
Staten Island Edison, pf.—$6—no par.	99	99	103½
Superheater, $6 com.—no par	148	148	175
Syracuse Lighting, 7% pf.	110	103	112½
Syracuse Lighting, 8% pf.	*m*120	114	121
TAMPA ELEC., com. $2.	*m* 63½	62	71
Tenn. Elec. Pwr., 6% pf.	99	92	103
Tenn. Elec. Pwr., 7% pf.	106	106	110
Tex. Pwr. & Lt., 7% pf.	112	112	115
Tide Water Pwr., 8% pf.	108	108	112
Timken Roller Bear., com.—$4 no par.	128½	112½	134
Toledo Edison, 7% pf.	109	108	111
Toledo Edison, 6% pf.	105	95	105
Toledo Edison, 6% com.	*m*145	120	150
Tri-City Ry. & Lt., 6% pf.	90	88	102
UNITED GAS & ELEC., 7% pf.	100	98	103
United Gas & Elec. (N. J.), 5% pf.	75	70	77
United Gas Impr., $4 com.—50.	135½	114½	149½
United Lt. & Pwr., pf.—$4—no par.	*m* 55	49	56½
United Lt. & Pwr., pf.—$6.50—no par.	101	94½	103½
United L. & P., com. A .48—no par	*m* 25½	13½	27½
United L. & P., com. B .48—no par.	*m* 30	20	37
Utah Pwr. & Lt., 7% pf.	108	109½	112
Utica Gas & Elec., 7% pf.	106	105	107
Utica Gas & Elec., 8% com.	*m*200	200	225
Utilities Pwr. & Lt., 7% pf.	98½	98	104
Utilities Pwr. & Lt., com. A $2.	38	13½	27½
Utilities Pwr. & Lt., com. B $1—no par.	28½	18½	32½
VERMONT HYDRO-ELEC., 7% pf.	99	95	102
Virginia Elec. & Pwr., 7% pf.	*m*108	108	111
Virginia Public Service 7% pf.	102	97	103½
WAGNER ELEC., 7% pf.	*b*104	96½	107
Wagner Elec., com.—no par.	*b* 94½	37	120
Washington Ry. & Elec., 7% com.	400	....	....
Washington Ry. & Elec., 5% pf.	*j* 99½	....	....
Washington Wtr. Pwr., 8% com.	225	175	235
West Penn Elec., 7% pf.	110	108	115
West Penn Elec., 6% pf.	100	98½	104½
West Penn Pwr., 7% pf.	115½	114½	118
West Penn Pwr., 6% pf.	108	103	113
West Virginia Lt., Ht. & Pwr., 7% pf.	95	94	100
Western Pwr., 7% pf.	104	98	105
Western States Gas & Elec., 7% pf.	*m* 99	99	106
Westinghouse Elec. & Mfg., $4 com. —50.	94½	88½	112
Weston Elec. Instrument, Cl. A $2 —no par.	32½	30½	36½
Weston Elec. Instrument, com.—no par.	22	12½	28½
Wheeling Elec., 6% pf.	106	95	109
Worthington Pump, 7% pf. A.	48	46½	58½
Worthington Pump, 6% B.	48	41	51
Worthington Pump, com.	39½	28	40½
YALE & TOWNE com. $4—25.	*m* 67	67	84½

Stock Exchange: *a*Chicago; *b*St. Louis; *c*Philadelphia; *d*Boston; *e*Baltimore; *f*Montreal; *g*Cincinnati; *h*San Francisco; *i*Pittsburgh; *j*Washington; *k*Cleveland. *l*Bid price Saturday, Aug. 4. *m*Bid price Wednesday, Aug. 8. *n*Latest quotation available. †Dividend rate variable.

mund, 120 km., making a total of 2,575 km.

In German main-line electrification single-phase current of 16⅔ cycles is employed, the same as in Austria, Switzerland, Norway and Sweden. Alternating current has proved the most satisfactory from the standpoint of simplicity in equipping the sections and rolling stock. Future extensions are to be made on the basis of this system.

The total costs of a completed alternating-current overhead cable system for a double line section (outside stations) at present amounts to between 7,500 and 10,500 marks per track kilometer, according to the nature of the ground, the curves and the material used for the cables (bronze or steel). The chief section for which direct current (800 volts) is used is the Berlin City & Suburban Railways. The total cost of electrification of this railway for a length of 240 km. has amounted to 162,000,000 marks, 80,000,000 being for rolling stock and the remainder for cables, third-rail system, rectifier plants, switchgear, and repair shops. Rectifiers have been installed on the whole of the recently electrified sections of this railway, those placed in operation on the Velten line two years ago having proved very satisfactory.

JOHNS-MANVILLE INCOME UP.—Consolidated net income of the Johns-Manville Corporation and subsidiary companies for the quarter ended June 30 amounted to $1,600,438 after all expenses and federal income taxes. Net income for the first quarter was $772,705, making total income for the six months to June 30, $2,373,144.

Shawinigan Buys Balance of Laurentide Stock

The Shawinigan Water and Power Company has purchased the Laurentide Company's holdings in the Laurentide Power Company, Ltd., at $150 in cash and one share of Shawinigan stock for each share of Laurentide Power. This places a value of around $240 on the stock at current prices for Shawinigan.

The Laurentide Company which is a subsidiary of the Canada Power & Paper Company, holds 72,000 shares of Laurentide Power stock. On these shares it was receiving, at the annual rate of $5 a share. On 72,000 shares of Shawinigan, the company would receive at current rates a total of $144,000 in dividends. In addition, the company would be able to figure a return

of perhaps 5 per cent on the $10,800,000 cash involved in the transaction, or $540,000. Adding the $144,000 dividends on the Shawinigan shares would give a total of $684,000 a year, which compares with $360,000 received in dividends on Laurentide Power stock.

Company Reports

Name of Company	Gross Earnings Twelve Months Ended June 30 1928	1927
Bangor Hydro-Electric	$1,910,466	$1,815,078
Central and South West Utilities & subs.	29,571,922	26,579,430
Central Illinois Light	4,571,499	4,334,597
Central Illinois Pub. Service	13,594,884	13,279,638
Cities Service	33,187,476	29,275,842
Columbia Gas & Electric	101,776,636	96,058,586
Commonwealth Power	55,650,478	51,455,349
Consumers Power	28,423,804	25,537,927
Detroit Edison*	25,956,723	23,878,033
Fort Worth Power & Light†	3,095,116	2,865,637
Illinois Power	2,671,564	2,612,172
Interstate Public Service	10,297,762	9,937,146
Kansas City Power & Light	13,304,750	11,512,042
Nebraska Power†	5,047,479	4,569,790
North American & subs.	128,136,507	119,638,392
Ohio Edison	2,000,632	1,877,824
Penn-Ohio Edison and Northern Ohio Power	25,862,667	25,585,603
Portland Electric Power	12,303,415	12,059,283
Public Service of New Hampshire & subs.	3,695,592	3,534,808
Southern California Edison	32,629,041	29,780,860
So. Indiana Gas & Electric	3,083,372	2,986,171
Southwestern Gas & Electric	6,321,996	5,048,380
Tennessee Electric Power	12,907,557	12,209,910
Texas Power & Light†	9,488,277	8,584,391
West Penn Electric†	37,384,444	35,819,837

*Six months ended June 30. †Twelve months ended May 31.

Seattle Department of Lighting to Reduce Its Debt

With an increase of at least $400,000 expected in its revenue receipts, the Seattle light department will do a $7,000,000 business in 1929, according to the report of J. D. Ross, superintendent of the department. It will pay off $1,046,000 of its bonded debt and set aside $360,000 into the sinking fund for retirement of bonds maturing later. Ross estimates gross receipts for 1929 at $6,900,000, of which $5,400,000 will be derived from sale of current, as compared with $5,000,000 estimated for the 1928 budget.

In addition the department will get $650,000 from merchandise sales, $150,000 from labor and material bills owed by other city departments and $700,000 from repayment out of bond funds of money advanced from current funds to finance new construction work.

Expenses, Mr. Ross figures, will total $5,829,920, a slight increase over this year's probable aggregate, leaving a net balance for the year of $70,079.

For salaries and other payroll expense, $2,517,698 will be spent; for supplies, including $500,000 worth of electrical merchandise to be sold, $1,420,240; for payment of bond interest, $1,435,982.41; for bond redemption, $1,046,000; for sinking fund, $360,000; for transfers to depreciation, $50,000.

In addition to the $360,000 to be placed in the sinking fund for redemption of twenty-year general bonds, the department has on hand $268,000 saved for this purpose from its 1928 receipts. "The $1,046,000 set aside for bond redemption and $360,000 for sinking fund represent profits of the system," Mr. Ross declared.

THREE YEARS' EARNINGS RECORD OF CONSOLIDATED GAS, ELECTRIC LIGHT & POWER COMPANY OF BALTIMORE

	1928	1927	1926
Gross revenue	$13,411,036	$12,758,557	$12,794,229
Expenses, taxes and depreciation	8,854,253	8,622,397	8,352,046
Operating income	$4,556,783	$4,136,160	$4,442,183
Other income	222,610	234,416	125,130
Total income	$4,779,393	$4,370,576	$4,567,313
Fixed charges	1,536,548	1,551,397	1,452,673
Net income	$3,242,845	$2,819,179	$3,114,640
Dividends	1,897,180	1,585,700	1,476,522
Surplus	$1,345,665	$1,233,479	$1,638,118

SAN JOAQUIN LIGHT SHOWS LARGER EARNINGS. — San Joaquin Light & Power Corporation's net earnings for the year ended June 30 available for dividends were $2,671,565, against $1,846,116 for the preceding year, a gain of $825,449, or nearly 45 per cent. This is equivalent to $16.31 a share on the 163,765 shares of 6 and 7 per cent prior preferred stock outstanding, against $11.27 a share for the comparative twelve months, based on same capitalization.

Consolidated Gas of Baltimore Earning $1.44 on Common

Both gross and net earnings of Consolidated Gas, Electric Light & Power Company of Baltimore showed substantial increases for the six months ended June 30. Gross revenue for the first six months of the past three years along with the various items of the earnings statements are shown in the accompanying table.

Investment Bankers' Report Has Pertinent Suggestions

SOME pertinent suggestions are found in the recently published report of the public service securities committee of the Investment Bankers' Association of America. After discussing the warning with regard to government control issued a year ago, and the progress of legislation arising out of Senator Walsh's resolution, the report deals with the so-called Massachusetts case:

The Massachusetts "case" in which legislation forcing utility corporations to enter into a contract with the State in which they would agree not to appeal to the federal court for rate decisions; the company declining to enter such contract not to be protected against corporations municipally owned, or other companies, and to lose the right of eminent domain, is attacked in the report against the best interests of utilities of that State in that it would "adversely affect credit and would retard the flow of junior and senior capital into the business and probably depreciate the value of now existing securities."

This bill, however, has now been pigeon-holed but in its stead the committee reports a new proposal, to place in the hands of "the Massachusetts Department of Public Utilities the right to investigate ways and means for the investigation of rates, values and capital issues of gas and electric companies in such a way as to be fair alike to the public and the companies concerned."

"In the judgment of your committee this places the Massachusetts situation practically back where it was in the early months of this year and makes it vitally necessary that the Massachusetts group, as well as the public service securities committee, bend every effort toward the protection of vested rights in this matter," the report says.

Considerable opposition to the legislation proposed by Senator Norris to limit the jurisdiction of the district courts of the United States is urged upon the association. The aim of such opposition, the report points out, is to protect the investor in utility investments, as the proposed legislation "is detrimental to the interests of the investor primarily" and "detrimental to the utility situation as a whole."

In view of the recent amendments to the banking and insurance laws the situation in New York State is regarded as favorable and as partially offsetting the problems in other sections. Especial reference is made in the report to Chapter 448 of the amending measure, which "affords the right to purchase bonds of any corporation incorporated under the laws of the United States, or any State thereof of the District of Columbia and transacting the business of supplying electrical energy and gas, or both, for light, heat and power, provided at least 75 per cent of the gross operating revenues are derived from such business and that the issuing corporation is subject to regulation by a public utility commission or other similar regulatory body duly established by the laws of the United States or the State in which such corporation operates.

"This act of the New York Legislature is a step forward in the investing in public utility securities and naturally will afford them a very much wider market than heretofore. This action on the part of the Legislature is called particularly to your attention as it is so entirely contrary to the attacks upon utility corporations fostered by legislatures of neighboring States and by certain individuals in the Senate of the United States."

Business News and Market Conditions

J. H. McGraw Award to Contractor-Dealer

Contractor-dealer Medal and Purse for 1928 Awarded to N. J. Biddle of Detroit — Certificate of Honorable Mention Presented to Earl N. Peak

AT THE convention of the Association of Electragists held at the Hotel Stevens, Chicago, this week the contractor-dealer medal and purse for 1928, given under the James H. McGraw award for electrical men, was presented to N. Jay Biddle of Detroit. The citation accompanying the presentation was as follows:

Nicholas Jay Biddle, manager Association of Electragists, Detroit, while an electrical contractor in that city for some years was deeply interested and concerned with the financial and economic difficulties which today beset this trade in so many communities. In order that he might devote himself to the study of these problems and to the improvement of these conditions he assumed the position of active head of the local contractors' association and undertook to find a practical solution. He became convinced that the basic trouble in the business ailment of the electrical contractor today rests in the carelessness with which credit is granted to him by the electrical jobber and the laxness with which this credit is used by the contractor himself.

By invoking the co-operation of the Detroit Association of Credit Men and the local electrical wholesalers, he effected the establishment of a general credit policy for the electrical trade, whereby on their own voluntary agreement the local contractors placed themselves on a 30-day credit basis, liquidating back balances by means of notes and inaugurating a system for clearing credits monthly to which the entire wholesale and retail electrical trade was ultimately committed. This plan has now been in complete operation for two years, with a credit committee of three, representing the contractors, wholesalers and credit men, acting in behalf of the contractors wherever an extension of credit or other consideration is warranted by special conditions. As a result the financial condition of the Detroit contractors has been greatly improved, the number of irresponsible contractors has been reduced almost one-half, the total of past due receivable on the books of the wholesalers has shrunk to one-third and the contracting trade is generally in a far more prosperous condition.

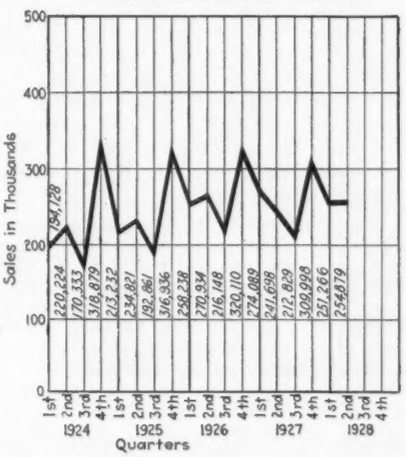
Through his personal leadership in initiating, organizing and operating this plan and his tireless effort in promoting the idea and administering the service as a member of the credit committee, Mr. Biddle has carried this program through its early status of a laboratory experiment and made it a valuable contribution to the advancement of the contractor-dealer branch of the electrical industry, for already the plan has spread and is in use throughout all southern Michigan, clearing through Grand Rapids and Detroit. Therefore the judges have awarded to Mr. Biddle the contractor-dealer medal and purse for 1928, given under the James H. McGraw Award.

The committee of judges which awarded the medal to Mr. Biddle consisted of James R. Strong, L. K. Comstock, Allan Coggeshall, and C. C. Bohn. The committee of awards consisted of W. W. Freeman, H. B. Crouse, W. E. Robertson, L. K. Comstock, F. W. Feiker and Earl Whitehorne. In addition to the award a certificate of honorable mention was presented to Earl N. Peak of Marshalltown, Iowa, together with the following citation:

Earl N. Peak, president of the Marshall Electric Company, Marshalltown, Iowa, and president of the Iowa Association of Electragists, for years has devoted himself to furthering a spirit of closer co-operation among the electrical contractors and dealers of that state and has succeeded in organizing them into a compact association, active in the promotion of the principles of sound business. More recently he has brought about the establishment of a joint committee of the electrical industry in Iowa representing the power companies, manufacturers, jobbers, contractors and dealers of that state, of which he is chairman, and through his leadership and personal effort, at the price of his own time and money, has carried forward a program of co-operation among the different branches of the industry that has produced splendid results both in harmony and in practical achievement. At the same time he has set a stimulating example of initiative and responsibility that should be an inspiration to the contractors of the country, to play a larger part in their relationship with the other branches of the industry.

In recognition of this constructive contribution to the advancement of the contractor-dealer branch of the electrical industry, the judges have extended to Mr. Peak a certificate of honorable mention given under the James H. McGraw award for 1928.

Vacuum-Cleaner Sales



Vacuum-cleaner sales by quarters during 1924, 1925, 1926, 1927 and the first and second quarters of 1928. The figures for the first quarter of 1928 have been revised and differ from those which appeared in the June 2, 1928, issue of the ELECTRICAL WORLD on page 1173. (Data supplied by Vacuum Cleaner Manufacturers' Association.)

Orders for Electrical Goods

Orders booked during the second quarter of 1928, as reported to the Department of Commerce by 86 manufacturers of electrical goods, were $244,440,063, as compared with $242,875,462, for the first quarter of 1928 and $236,427,121 for the second quarter of 1927. The accompanying table gives the bookings for each quarter since the beginning of 1923, not as a complete statement of the industry but as probably sufficiently representative to indicate the trend.

ORDERS FOR ELECTRICAL GOODS

Quarter	1923	1924	1925	1926	1927	1928
First	$225,399,383	$228,760,838	$233,023,182	$262,677,736	$243,651,415	*$242,875,462
Second	240,542,824	221,167,876	227,502,652	248,000,075	236,427,121	244,440,063
Third	201,910,099	185,747,314	232,933,532	241,114,209	235,847,857	.....
Fourth	218,165,415	231,470,552	244,597,050	260,078,082	239,999,298	.....
Total	$886,017,721	$867,146,580	$938,056,416	$1,011,870,102	$954,925,691	.....

*Revised.

National Electrical Code Status for 1928

The executive committee of the National Fire Protection Association has approved the report of the electrical committee and directed that the 1928 code be certified to the National Board of Fire Underwriters for printing and to the American Engineering Standards Committee for approval as an American standard. It is expected that the new code will be ready after Sept. 1. The letter ballot on approval of the 1928 code, which totals 43 votes, including the chairman, resulted in 40 votes in favor and three in the negative.

The executive committee of the N.F.P.A., following consideration of the brief filed for the light and power group in support of the negative ballots covering the 1928 code, empowered a sub-committee to act in the matter. After conference with representatives of the group the sub-committee proposed that a note be inserted after the title of Article 9, grounding, and reading:

The whole subject of grounding of equipment and appliances in interior wiring systems including methods of grounding by means of auxiliary conductors, what fixed equipment should be grounded and whether portables in domestic establishments need be grounded and if so how has not been fully established and is to be submitted to a general conference during 1928 with a view to a special report to the next meeting of the electrical committee of the

N.F.P.A. and appropriate action for the next edition of this code.

The committee hopes that this proposal will enable the A.E.S.C. to find a consensus on the question of approval of the 1928 edition. Advices received, however, indicate probably no action by the A.E.S.C. in time for the date set for code publication. It has been suggested, therefore, that the note proposed for insertion in Article 9 be dropped.

Market Conditions

STEADY business is reported in the electrical industry with some companies reporting a slow but continued increase as compared with last year's sales. The demand for power equipment was active in several territories. In New England buying showed a tendency to lag. A number of plant changes being planned in that district presage some interesting industrial orders. Several line extensions to be made in New Hampshire will soon require considerable material. Improved power equipment sales were reported in the Eastern district, and industrial plant buying of prime movers showed increasing activity. A paper mill in New Jersey purchased $35,000 worth of equipment and a chemical company placed an order for a 3,000-kw. turbo-generator unit. A metropolitan utility company ordered $400,000 worth of substation equipment and other orders for similar apparatus are anticipated. A power company in Albany purchased $45,000 worth of oil circuit breakers.

Sales are at a satisfactory level in the Southeast. A power company in South Carolina ordered a 30,000-kw. turbine at a cost of about $500,000, and a smaller company in Georgia bought $20,000 worth of pole line construction materials. A steady demand is noted in the St. Louis district. A power company in the Southwest ordered $50,000 worth of switching equipment and a steel mill bought $30,000 worth of additional apparatus. Increasing sales are reported in the Middle West. On the Pacific Coast equipment sales were active. The United States Navy purchased $39,000 worth of apparatus and a number of other industrial and power plant sales were reported. Manufacturers state that apparatus business is about 15 per cent better than that of last year.

Buying in New England Less Active

Buying has eased up a little in New England. Orders for small motors were steady and the weekly total was about normal. A number of plant changes, being planned in the district will require the delivery of large motors. One plant has placed an order for six and another for three 50-hp. motors. Fractional-horsepower motor sales are vigorous with machine tool manufacturers in the market. Central-station supplies are receiving fair attention. Small switch and control apparatus sales are heavy and ventilating power units and control were recently ordered for a number of schools and hospitals.

Transmission line supplies are active, and poles, wire and cross-arms are moving in good volume. Several line extensions in central New Hampshire will soon require considerable material. Orders for street traffic control signals are increasing; recently four were purchased for an eastern Massachusetts city. Electric industrial heating furnace orders have slackened, though a prominent manufacturer reports sales to date 25 per cent above the volume of last year. Interior electric lighting projects at this time are far ahead in number as compared with last year with prospects for unit type reflector sales in good quantity very promising. Construction projects are as follows:

The Charlemont Electric Light & Power Company, Charlemont, Mass., will carry out an improvement program to cost $100,000. The Raybestos Company, Bridgeport, Conn., plans a plant addition at Stratford, Conn., to cost $100,000. Sunfast Hats, Inc., Norwalk, Conn., plans a multi-story plant to cost $800,000.

Sales at Satisfactory Level in Southeast

Satisfactory business conditions are reported in the Southeast. A power company in South Carolina ordered a 30,000-kw. turbine at a cost of about $500,000. One of the smaller power companies in Georgia placed an order for pole line construction materials amounting to $20,000, while a small privately owned plant in the same state ordered similar materials to the extent of $5,000.

Power companies in Alabama and Tennessee placed orders for small power transformers totaling $9,000. Another interesting central-station order was for watt-hour meters totaling $8,300. Another central-station order was for poles amounting to $3,300 and distribution transformers totaling $3,200.

All merchandise items are in strong demand owing to sales activities of power companies. A central-station company recently closed a refrigerator campaign with sales totaling $255,000. The city of Atlanta let contracts covering the construction of its new City Hall at a cost of approximately $900,000. Construction projects are as follows:

New Martinsville, W. Va., has authorized a bond issue of $124,000, for its municipal power plant and distributing system. The Henry Vogt Machine Company, Louisville, Ky., has approved plans for an addition to its refrigerating equipment plant to cost $300,000. Paducah, Ky., is arranging a bond issue of $800,000, for a municipal power plant. The Broad River Power Company, Columbia, S. C., has authorized plans for a new unit at its steam electric power plant at Parr Shoals. The Mississippi Power Company, Gulfport, Miss., has secured Federal permission for a hydro-electric development at Colbert Station, near Riverton, Ala., with an initial capacity of 100,000 hp., and a steel tower transmission line. Burdine, Inc., Miami, Fla., plans a steam electric power plant on Southeast First Street to cost $85,000. Palmetto, Fla., is disposing of a bond issue of $35,000, for an ornamental lighting system and extensions in waterworks.

Improved Sales of Equipment Noted in Eastern Market

Noticeable improvement in the demand for heavy electrical machinery is reported in the Eastern district, with incoming inquiries showing tendencies of growing volume. Industrial account for prime movers is growing more active. A paper mill in northern New Jersey has contracted for equipment for a paper-making machine drive to cost about $35,000, while a chemical company in the same territory has placed an order for a 3,000-kw. turbo-generator unit, costing approximately $25,000.

Central-station business shows an encouraging increase in activity. A metropolitan utility company has placed a contract for substation equipment, including rotary converters, transformers and switchboards, to an amount of $400,000. Other power companies in this district are expected to place commitments for similar equipment within a short time. A light and power utility at Albany has contracted for oil circuit breakers to cost approximately $45,000. The demand for switchboard panels, instruments and affiliated apparatus is trending upward. A manufacturer of wire and cable reports conditions as very spotty, with inquiries comparatively light. Several light and power companies have been securing quotations and this pending business is expected to mature within a few weeks. Current construction operations in the Eastern district include the following:

The Westchester Lighting Company, Mount Vernon, N. Y., will build a substation at Elmsford to cost $325,000, in connection with extensions in transmission lines to cost $600,000. The Signal Corps Procurement District, Governor's Island, N. Y., will receive bids until Aug. 21, for 53,500 ft. subterranean telephone cable (Circular 3) and at the same time for 200,000 ft. cross-connecting wire (Circular 1). The Russell, Burdsall & Ward Company, Port Chester, N. Y., will build an addition to its bolt and nut plant at Sterling, Ill., to cost $100,000. The Behr-Manning Corporation, Watervliet, N. Y., will add to its abrasive plant at a cost of $125,000.

The Rockland Electric Company, Closter, N. J., will make improvements in plant and system to cost $300,000. Harrison, N. J., will install an ornamental lighting system. The Public Service Electric & Gas Company, Newark, N. J., plans a substation at Jersey City, N. J., to cost $55,000. The Philadelphia & Reading Railway, Phila-

delphia, Pa., plans a substation on Windrim Avenue. The Lehigh Valley Railroad Company, New York, will build an engine house with repair facilities at Lehighton, Pa., to cost $100,000.

The Pennsylvania Railroad Company, Pittsburgh, Pa., will carry out an expansion program in local terminal, shop, storage and yard facilities to cost $30,000,000. The Crown Cork & Seal Company, Baltimore, Md., will build an addition to cost $85,000. The United States Shipping Board, Washington, D. C., will receive bids until Aug. 21, for installation of main Diesel engines and other equipment on eight vessels. The General Purchasing Officer, Panama Canal, Washington, D. C., is asking bids until Aug. 27, for voltmeters, panel boards, reflectors, recording thermometers, etc. (Panama Schedule 1895).

Equipment Sales Active on Pacific Coast

Excellent motor and power apparatus sales marked the business on the Pacific Coast, with such orders as $9,000 worth of motors and control for the United States Navy Yard at Mare Island, $30,000 worth of motor testing stands for the United States naval station at San Diego, a 625-kva. generator, valued at $6,500, for a Hawaiian sugar plantation, two 500-kva. converters complete with transformers and accessories, at a total value of $30,000, for a Bay region industrial plant, a 2,000-kva. transformer, valued at $8,000, for a power company, two 200-hp. motors with accessories, valued at $4,000, for a gold-mining company, and many orders for small-size motors for pumping outfits and for operating fans and fire pumps in various buildings. Manufacturers state that this class of business is running about 15 per cent better than that of last year.

Certain steel companies are expected to be in the market shortly for about $30,000 worth of large motors for plant extensions. The outstanding announcement of prospective business is that of the Ford Motor Company, which will shortly request bids on its projected Coast plant, to be erected at Long Beach at a cost that will reach approximately $10,000,000.

A slight decrease in motor sales is reported by Seattle jobbers, although business was satisfactory and indications point to a good month. About 80 machines were reported sold, ranging from 100 hp. down. The majority of the small sizes were purchased by lumber mill and allied industrial sources. A box factory near Seattle and two cold storage plants in eastern Washington are asking for quotations on a number of motors. Klamath Falls, Ore., is planning a twenty-five-thousand-dollar street lighting job and a comprehensive street lighting system for Everett, Wash., is said to be assured. Construction projects are as follows:

The Buffalo Northwest Electric Company, Buffalo, Wyo., will build a two-story addition to its power plant to cost $35,000. The Idaho Portland Cement Company, Pocatello, Idaho, recently organized by H. R. and R. S. Turner, Pocatello, plans a cement mill at Inkom, near Pocatello, to cost $1,000,000. The Pacific Power & Light Company, Portland, Ore., plans extensions in transmission lines in vicinity of Walla Walla, Wash., to cost $75,000. The Western Wax Paper Company, North Portland, Ore., will build a one-story addition to cost $90,000. The Los Angeles Creamery Company, El Monte, Calif., plans a new plant to cost $100,000.

The Medford Ice & Cold Storage Company, Medford, Ore., plans a cold storage plant to cost $50,000. The Modesto Irrigation District, Modesto, Calif., is arranging an appropriation for new substations to cost $80,000, and a fund of $61,000, for transmission line extension. The Pacific Gas & Electric Company, San Francisco, will build a substation at Morgan Hill, Santa Clara County, to cost $30,000. Los Angeles, Madera, Oakland and Sacramento, Calif., Great Falls, Mont., Salem, Ore., and Tucson, Ariz., plan ornamental lighting systems.

Increasing Sales Reported in the Middle West

Good business continues in most sections of the Middle West. The volume is increasing and the outlook for the balance of the year is promising. Building activity is only slightly below that of last year and general employment is increasing. Industrial activity is increasing and an optimistic attitude is becoming quite general. Maintenance purchasing of utility companies is relatively high. Better business conditions are reflected in increased business for the jobbers. While residential building has slackened somewhat, larger projects being started lead to an increased volume of sales. Most appliances are moving in fair volume, while the recent hot weather stimulated the demand for fans. Construction projects are as follows:

The Otter Tail Power Company, Fergus Falls, Minn., plans extensions in transmission lines and distributing systems at Tower City and Starkweather, N. D. The Dura Company, Toledo, Ohio, plans an addition to its plant for the manufacture of window regulators to cost $100,000. The contracting officer, material division, air corps, Wright Field, Dayton, Ohio, will receive bids until Aug. 15, for 46,000 ft. shielded power cable and for 42,200 ft. ignition cable. The United States Aluminum Company, Cleveland, plans a five-story storage plant addition to cost $300,000. The Cadillac Malleable Iron Company, Cadillac, Mich., is arranging plant improvements to cost $100,000. The Municipal Utilities Company, Des Moines, Iowa, has secured a franchise for an electric power plant at Emmetsburg, Iowa.

The Consumers Power Company, Jackson, Mich., will build a transmission line to North Adams, Shaftsburg and Morrison Lake. The Board of Education, Grand Rapids, Mich., plans an addition to its vocational school to cost $175,000. The Phoenix Hosiery Company, Milwaukee, plans an addition to cost $100,000. The Sunrise Dairy Products Company, Chicago, plans a creamery and condensing plant at Spring Valley, Wis., to cost $100,000. Cedar Rapids, Iowa, is asking bids until Aug. 16, for an ornamental lighting system on Fourteenth Avenue. Minot, N. D., and Virginia and St. Paul, Minn., plan ornamental lighting systems. St. Paul, Minn., will soon ask bids for a flood lighting system for its municipal airport.

Steady Demand Reported in St. Louis District

Conditions in the St. Louis district are steady with the demand for stock sizes of apparatus of all kinds continuing good. One order for switching equipment amounting to $50,000 was placed by a company in the Southwest for transmission line extensions. Another order from the western part of the district was for $30,000 worth of additional equipment for a steel mill, including a large motor generator set for furnishing current for driving rolls. Business is generally satisfactory in the construction field. The demand for supply material is reported to have decreased somewhat. Construction projects are as follows:

The Arkansas-Missouri Power Company, Blytheville, Ark., plans a transmission line to Deering, Mo. Anheuser-Busch, Inc., St. Louis, Mo., is building a power plant at its factories to cost $1,000,000. The State Board of Public Affairs, Oklahoma City, Okla., has filed plans for a power plant at the State School for the Blind, Muskogee, to cost $35,000. The Camden Furniture Company, Camden, Ark., plans a new factory to cost $75,000. The Oklahoma Railway Company, Oklahoma City, Okla., plans new repair shops on Noble Street, to cost $100,000. The Oklahoma Gas & Electric Company, Oklahoma City, Okla., has approved plans for a one-story storage plant at Shawnee, Okla., to cost $50,000.

The Superior Feed Mills Company, Oklahoma City, Okla., plans a milling plant to cost $100,000. W. D. Hayden, Houston, Tex., and associates have engaged Arnold & Weigel, Woodville, Ohio, engineers, to prepare plans for a lime-manufacturing plant to cost $300,000. Armour & Company, Chicago, plan a meat-packing plant at Monroe, La., to cost $125,000. The Gulf States Utilities Company, Beaumont, Tex., plans a transmission line from Opelousas to Reddell and Pine Prairie, La., to operate at 33,000 volts. The Texas-Louisiana Power Company, Fort Worth, Tex., plans a substation at League City, Tex., with a transmission line from Dickinson. Wynne, Ark., plans an ornamental lighting system.

Metal Market Quiet, but Prices Are Firm

There has been no pronounced activity in the non-ferrous metal markets, but a fair business has been transacted and prices are firm. Sales of copper in the aggregate were only a little below average and the same statement applies to lead. Zinc, on the other hand, after an exceptionally large turnover in the preceding week was dull.

NEW YORK METAL MARKET PRICES

	Aug. 1, 1928 Cents per Pound	Aug. 8, 1928 Cents per Pound
Copper, electrolytic	14.5375	14.525
Lead, Am. S. & R. price	6.20	6.20
Antimony	10.00	10.00
Nickel, ingot	35	35
Zinc spots	6.55	6.60
Tin, Straits	48.125	48.25
Aluminum, 99 per cent.	24.30	24.30

Base copper wire price Aug. 8, 1928, 16½ cents.

Activities of the Trade

Combustion Sells Big Units to New York Edison

One of the largest contracts in the history of the Combustion Engineering Corporation, New York, has just been placed with it by the New York Edison Company. It is for four complete steam generating units, each containing 40,700 sq.ft. of boiler heating surface and 4,420 sq.ft. of heating surface in the furnace. The aggregate of 45,120 sq.ft. of heating surface per unit will make these the largest units in the world. Each unit is guaranteed to produce 550,000 lb. of steam per hour. However, the Edison company will install sufficient forced- and induced-draft fan capacity to permit the operation of these units at peak productions of up to 800,000 lb. of steam per hour.

The boilers will be of the double Ladd type and will be designed for a maximum pressure of 500 lb. and operating pressure of 425 lb. The furnaces will be equipped with "C-E" fin tubes in all four walls, "C-E" fin tube arch screens and "Lopulco" water screens. Ten "Lopulco" Couch type burners will be installed in each furnace, five in each side wall. The coal will be fed to the burners by ten "Lopulco" type R feeders. Eight "C-E" air preheaters will be installed, two for each unit. Each preheater will have a total heating surface of approximately 35,000 sq.ft.

Many difficult engineering problems were solved in designing these units, owing to the necessity of producing apparatus that would fit limited space conditions and yet assure the steam production required—2,000,000 lb. per hour.

THE BRYANT ELECTRIC COMPANY, Bridgeport, Conn., manufacturer of wiring devices, is now offering a line of "De Luxe" plates made with mahogany and Circassian walnut inlay with genuine bronze of nickel silver borders.

THE HOOVER COMPANY, North Canton, Ohio, announces that since Aug. 1 it has reduced prices on all Hoover electric cleaner models on the Pacific Coast, lowering retail and dealers' prices in the West to the same level as prevails east of the Rockies.

THE LIBERTY GAUGE & INSTRUMENT COMPANY, Cleveland, announces new portable heaters known as the "Liberty Golden Glow," which are made in colors of lettuce green, orchid, ivory, rose and bronze. The bronze will sell at $4.65 retail and the colors at $4.95 retail.

THE GENERAL ELECTRIC COMPANY will hold a convention of its 230 distributors of the electric refrigeration department from Sept. 4 to 7 at Association Island, Henderson Harbor, N. Y. The convention will be know as Camp Refrigeration II. Plans for the coming year will be discussed and distributors will participate in an exchange of ideas. Harry C. Mealey, assistant to the manager of the refrigeration department at Cleveland, has been appointed camp manager.

THE COMBUSTION ENGINEERING CORPORATION, International Building, 200 Madison Avenue, New York City, announces appointment of W. O. Renkin as manager industrial furnace department.

THE GENERAL ELECTRIC COMPANY has taken bids on a general contract for an equipment storage and distributing plant, with service and repair departments, at Pershing Road and Ashland Avenue, Chicago.

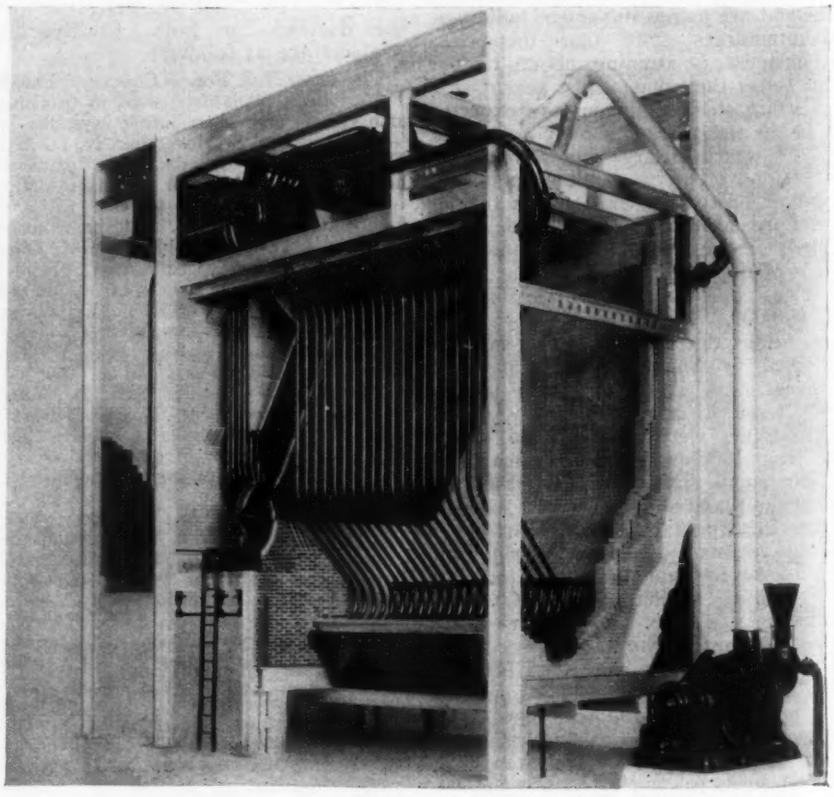
THE WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY has announced the winners of the 1928 competition for its War Memorial Scholarships. The successful candidates are: Paul S. Marthens, 944 Sycamore Street, Turtle Creek, Pa.; Winton M. Dudley, Fifteenth Street, Oakmont, Pa.; Marshall A. Wilson, 9737 Vanderpoel Avenue, Chicago, and D. Gordon Sharp, 40 Prospect Street, Bloomfield, N. J. The scholarships, which are awarded annually in memory of Westinghouse employees who served in the World War, provide annual payments of $500 each to be applied toward a four-year engineering education in any technical school or college that the winner selects. They are allotted by means of competitive examinations to youths who are either employees of the company or sons of employees.

THE GENERAL ELECTRIC COMPANY paid $1,600,905 in supplementary compensation on July 30 to employees in its various plants and offices who have been with the company for five years or more. This sum represents 5 per cent of the earnings of employees for the six months ended June 30, 1928.

THE GRAYBAR ELECTRIC COMPANY, New York City, announces the opening of three new branches, located at Trenton, N. J.; Beaumont, Tex., and Wichita, Kan. L. O. Crocker is sales manager at Trenton, John P. O'Neil sales manager at Beaumont and R. L. Miller sales manager in Wichita.

THE WHEELER ELECTRIC COMPANY, 275 Congress Street, Boston, announces a series of new material pertaining to industrial illumination, as follows: The "Durex" de luxe reflectors with polished cast aluminum canopies, the "Durex" duplex outlet box canopy, "Vapolux" fixtures, "Shadowless" indirect fixtures, a pool table reflector, a bottom locking socket, and a ball and socket aligner for 4-in. outlet boxes.

Model of Erie City Steam Unit for Smithsonian Institution



One-twelfth scale model showing the application of a water-cooled furnace, an integral economizer and three-drum boiler of the Erie City Iron Works fired by a pulverizer unit.

New Equipment Available

Worm Gear Speed Reducer

A line of ball bearing worm gear speed reducers, known as the "IXL Hygrade" speed reducer, has been placed on the market by the Foote Brothers Gear & Machine Company, Chicago. In these speed reducers a high helix angle is used on the tooth and multiple thread worms which is said to insure rolling action of the teeth that greatly reduces frictional losses and heating and insures very high efficiency for the unit. In lower ratios the efficiency of this speed reducer is said to be equal to or greater than that of the spur gear type. High ratios of reduction up to a maximum of 10,000 to 1 are possible with the use of double reduction units.

Double-Duty High-Voltage Fusible Cutout

A new type of high-voltage fusible cutout has recently been introduced by the General Electric Company for outdoor service. It is available in voltages from 7,500 to 73,000 and current ratings from that suitable for use with a potential transformer to 100 amp. The new cutout is said to have a high interrupting capacity and not only provides a spring expulsion circuit-breaking feature, but also serves as a disconnecting switch. The cutout is assembled on cemented cap and pin type insulators and is designed for vertical mounting. It is designated as type EF-1.

The high-voltage fuse used with the above cutout consists of a treated fiber tube with a metal ferrule at each end. After operation, the tube and link must be replaced by a new factory-filled unit. This obviates the possibility of poor operation resulting from improper refusing in the field. A fuse hook with a special end casting is used to install or remove the fuse.

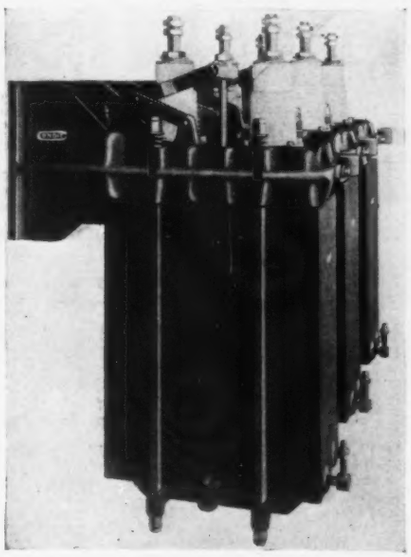
Motor-Generator Set for Chromium Plating

An improved form of motor-generator, especially designed to furnish power for electrolytic chromium plating, has been placed on the market by the Eager Electric Company, Watertown, N. Y. The sets are built in several standard forms, in ratings ranging from 2,000 amp. to 10,000 amp. at 6 to 12 volts, in steps of 500 amp. Each set consists of a slow-speed, separately excited synchronous motor, driving a direct-current electrolytic generator.

The set is of the two-bearing type and is fitted with Timken tapered roller bearings. The brush-holders are made from steel punchings, plated with copper and cadmium to resist the corrosive agents usually found in the atmosphere of plating rooms, and the brush-holder supports are made of heavy sections, which are cast integrally with the generator field frame.

Oil Circuit Breaker with High Interrupting Capacity

An oil circuit breaker of relatively high interrupting capacity and comparatively small over-all dimensions, known as the type D-127, has been placed on the market by the Condit Electrical Manufacturing Corporation, Boston. An exceptionally heavy and rugged frame



Rugged construction and high interrupting capacity characterize this breaker

construction is used throughout and double tanks are furnished, supported by a heavily ribbed cradle, which is in turn hung by strong bolt construction with resilient features. The purpose of this type of construction is to absorb the mechanical shock incident to interrupting a heavy short circuit and to reduce to a minimum the hazard which usually follows the throwing of hot oil and gases emitted on heavy short circuits.

The main current-carrying contacts are Condit inverted laminated brushes of special design which it is said are able to withstand extremely high inrush currents. Exceptionally heavy arcing contacts with a large thermal absorption capacity are used. The D-127 oil circuit breakers are built in single units for 400, 600, 800 and 1,200 amp. at 15,000 volts, 1,600 amp. at 7,500 volts and can be furnished for single-pole or multipole operation. The estimated interrupting capacity is 8,000 amp. at 7,500 volts. Owing to the small space requirements of the type D-127 oil circuit breakers, they are particularly adapted for replacing present breakers inadequate to meet the interrupting requirements of a station where large breakers could not be installed without considerable change in cell construction.

Portable Welder

A new mounting of the Lincoln electric "Stable Arc" welder which attaches to either the McCormick-Deering 10/20 or Fordson tractors, has been announced by the Pontiac Tractor Company, Pontiac, Mich. This mounting of the Pontiac-Lincoln arc welder gives a four-wheel, rubber-tired, self-propelled unit capable of hauling heavy leads behind itself. This unit is also mounted on crawlers for soft ground work. Power is taken from the tractor, to drive the welder, through the power takeoff pulley, which has a clutch, allowing it to be thrown out or into gear at will. The ahead drive of the belt brings the belt tightener into the correct relation with the belt.

DISCONNECT FOR TRUCK TYPE OIL CIRCUIT BREAKERS.—A disconnecting switch with a full floating contact for use on truck-type oil-circuit breakers has been placed on the market by the Railway & Industrial Engineering Company, Greensburg, Pa. This switch, which has a large capacity for misalignment, was described on page 97 of the July 14, 1928, issue of the ELECTRICAL WORLD, but in that issue it was not mentioned that the switch was for use on truck-type oil-circuit breakers. Other details regarding this switch will be found in the item referred to.

ACROSS-THE-LINE REVERSING SWITCH —A motor control switch suitable for reversing small alternating-current motors in cases where the motor can be thrown across the line is being marketed by the General Electric Company. It consists of two triple-pole, barrier-type, magnetically operated contactors, mechanically and electrically interlocked, and two hand-reset temperature overload relays mounted on a molded base and inclosed in a drawn-shell case. The double-break contactors with silver contacts, operated by a high-speed solenoid, are said to give the switch a very high interrupting capacity with minimum arcing. The new type silver contacts eliminate the need for the shunt straps and, since silver oxide is a conductor, minimize contact resistance.

SELF-PROPELLING AIR COMPRESSOR. A self-propelling four-whheel air compressor, capable of handling heavy loads behind itself and moving about on the job under its own power, is being manufactured by the Pontiac Tractor Company, Pontiac, Mich. The compressor is a Quincy type W-4 of 124 cu.ft. displacement, having a separate radiator with pump-driven circulation. The unit is controlled by a Penn unloader with hand unloader attachment. The compressor with air tank and tool box are mounted on a frame which attaches to either the McCormick-Deering or Fordson tractors.

Electrical Patents

Announced by U. S. Patent Office

(Issued July 17, 1928)

1,677,299. ELECTRIC STEAM BOILER; S. Schneider, Meissen I., Saxony, Germany. App. filed March 4, 1927.

1,677,302. INDUCTION RELAY; H. P. Sleeper, East Pittsburgh, Pa. App. filed Feb. 3, 1923.

1,677,306. NON-ARCING ELECTRIC WELDING TONGS; C. L. Stancliff, Bakersfield, Calif. App. filed June 15, 1927.

1,677,312. BATTERY CONNECTER; J. M. White, Philadelphia, Pa. App. filed March 2, 1926.

1,677,313. ELECTRIC HEATING UNIT; J. C. Woodson, East Pittsburgh, Pa. App. filed June 23, 1925.

1,677,323. SAFETY SWITCH MECHANISM; H. G. Baxter, Baldwin, N. Y. App. filed April 25, 1921.

1,677,326. BUS-BAR OR CABLE CONNECTERS; D. A. Bowen, New York, N. Y. App. filed Sept. 28, 1923.

1,677,328. AUTOMATIC RECLOSING CIRCUIT INTERRUPTER; C. A. Butcher, East Pittsburgh, Pa. App. filed April 25, 1921.

1,677,332. LINER FOR ELECTRICAL CONNECTERS; M. M. Clayton, Baden, Pa. App. filed June 7, 1926.

1,677,333. ELECTRICAL INTERFERENCE PROTECTIVE SYSTEM; C. Le G. Fortescue and R. D. Evans, Pittsburgh, Pa. App. filed Sept. 29, 1922.

1,677,334. THERMOSTATIC OVERLOAD SWITCH; B. E. Getchell, Plainville, Conn. App. filed April 10, 1926.

1,677,335. AUTOMATIC ELECTRIC SWITCH; B. E. Getchell, Plainville, Conn. App. filed April 10, 1926.

1,677,336. INDUCTION RELAY; S. L. Goldsborough, Pittsburgh, Pa. App. filed May 25, 1925.

1,677,346. HIGH VOLTAGE INSULATOR; R. P. Jackson, Edgewood Park, Pa. App. filed Oct. 2, 1922.

1,677,350. CASING FOR ELECTRICAL APPARATUS; A. C. Kleckner, Racine, Wis. App. filed Aug. 26, 1926.

1,677,378. DEVICE FOR INDICATING THE QUOTIENT OF TWO ELECTRICAL QUANTITIES; D. Albrecht, Berlin, Germany. App. filed Oct. 20, 1926.

1,677,393. THERAPEUTIC BATH CABINET; R. J. Kideney, Buffalo, N. Y. App. filed Oct. 2, 1926.

1,677,412. IMITATIVE CANDLE FITTING; R. D. Smith, Pleasantville, N. Y. App. filed Jan. 29, 1923.

1,677,433. ELECTRIC MOTOR AND DYNAMO MACHINE; C. L. Daun, Milwaukee, Wis. App. filed Jan. 26, 1928.

1,677,445. BATTERY-TERMINAL CLAMP; G. Hardos, Dunmore, Pa. App. filed July 26, 1926.

1,677,458, 1,677,459. STRANDED CABLE; C. A. Parsons, J. Rosen, A. W. Grey and R. W. Midgley, Newcastle-on-Tyne, England. Apps. filed May 1, 1922, and Oct. 3, 1927.

1,677,498. APPARATUS FOR UNDERCUTTING PIN HOLES IN THE CENTER SHELLS OF INSULATORS; W. H. Smith, Norristown, Pa. App. filed Jan. 11, 1927.

1,677,509. COMPACT ELECTRIC SWITCH; M. S. Wright, Worcester, Mass. App. filed Oct. 3, 1921.

1,677,512. BATTERY SEPARATOR; R. C. Benner, Bayside, N. Y. App. filed March 30, 1923.

1,677,521. ARC PROJECTOR LAMP; T. Hall, Brooklyn, N. Y. App. filed Aug. 24, 1921.

1,677,528. ROTARY-FIELD INDUCTION FURNACE; E. F. Northrup, Princeton, N. J. App. filed March 12, 1924.

1,677,537. ELECTRIC TRANSFORMER; W. S. Werner, Covington, Ky. App. filed June 2, 1921.

1,677,553. AIR HEATER; T. B. Dissett, East St. Louis, Ill. App. filed June 21, 1927.

1,677,622. TOOL FOR SCREW PLUGS; E. J. Dreuil, New Orleans, La. App. filed Oct. 19, 1926.

1,677,628. CABLE CONNECTER FOR OUTLET BOXES; H. V. Gould, Bridgeport, Conn. App. filed Jan. 12, 1927.

1,677,629. ATTACHMENT FOR ELECTRIC LOGS AND GRATES; F. G. Gross, Chicago, Ill. App. filed Aug. 24, 1925.

1,677,644. AUTOMATIC BATTERY-CHARGING SYSTEM; C. E. Lomax, Chicago, Ill. App. filed Aug. 18, 1924.

1,677,657. ARC-LAMP MOTOR FEED; A. C. Roebuck, Chicago, Ill. App. filed April 17, 1922.

1,677,674. PRODUCING PERMANENT MAGNETS; L. E. Howard and A. D. Potts, Lockport, N. Y. App. filed Oct. 9, 1926.

1,677,681. HORIZONTAL CORE TRANSFORMER; V. M. Montsinger, Pittsfield, Mass. App. filed Oct. 25, 1927.

1,677,689. VAPOR ELECTRIC RECTIFIER; L. T. Robinson and C. A. Sabbah, Schenectady, N. Y. App. filed Nov. 19, 1925.

1,677,692. ELECTRICAL CUT-OUT FOR LUMINOUS TUBES; J. F. Stokes, New York, N. Y. App. filed July 9, 1927.

1,677,694. FREQUENCY-RESPONSIVE INSTRUMENT; F. B. Vogdes, Schenectady, N. Y. App. filed April 29, 1922.

1,677,696. EXIT-LIGHTING SYSTEM; R. T. Williams, Chicago, Ill. App. filed Jan. 14, 1927.

1,677,699, 1,677,700. SYSTEM OF DIRECT CURRENT ELECTRICAL DISTRIBUTION; E. F. W. Alexanderson, Schenectady, N. Y. App. filed May 13, 1927.

1,677,702. CONTROL OF ELECTRIC CIRCUITS; H. Bany, Scotia, and D. C. Hoffman, Schenectady, N. Y. App. filed Aug. 12, 1927.

1,677,706. ROTARY SWITCH HANDLE; A. W. Clauder, Bridgeport, Conn. App. filed Nov. 1, 1924.

1,677,710. TEMPERATURE REGULATOR; A. Däniker, Zurich, Switzerland. App. filed Feb. 18, 1927.

1,677,712. ELECTRODE HOLDER; J. Dion, Bitterfeld, Germany. App. filed Nov. 6, 1926.

1,677,713. CIRCUIT BREAKER; H. D. Dunton, Schenectady, N. Y. App. filed May 28, 1926.

1,677,715. AUTOMATIC SWITCHING SYSTEM; W. N. Gittings, Springfield, Pa. App. filed Dec. 23, 1927.

1,677,719. KEY-LOCKING ELECTRIC SWITCH; M. J. Lewis, Massillon, Ohio. App. filed Jan. 26, 1927.

1,677,720. ELECTRIC CUT-OUT; G. F. Lincks, Pittsfield, Mass. App. filed Dec. 17, 1924.

1,677,734. TERMINAL CONNECTER; L. O. Smith, Brooklyn, N. Y. App. filed May 11, 1927.

1,677,744. REVERSING DEVICE FOR TAPPING MACHINES; B. S. T. Bishop, Shrewsbury, and H. A. Jacobson, Worcester, Mass. App. filed Feb. 3, 1926.

1,677,783. ELECTRICAL CONNECTION; J. R. Kearney, Kansas City, Mo. App. filed April 24, 1922.

1,677,817. APPARATUS FOR ELECTROPLATING; J. DeVerre, Oakland, Calif. App. filed Jan. 26, 1923.

1,677,832. ELECTRIC WELDING OF LONG SEAMS; J. F. Lawson, Brooklyn, N. Y. App. filed June 7, 1924.

(Issued July 24, 1928)

1,677,886. VARIABLE RESISTANCE; E. C. Ballman, St. Louis, Mo. App. filed Feb. 10, 1923.

1,677,936. ELECTRIC MOTOR; C. H. Thordarson, Chicago, Ill. App. filed Feb. 27, 1925. Made largely by stamping and swaging operations.

1,677,943, 1,677,944, 1,677,945. METHOD AND APPARATUS FOR MEASURING DISTANCE; R. L. Williams, Newton, Mass. App. filed Jan. 17, 1924. In the aid of navigation.

1,678,001. PERMANENT-MAGNET STEEL; P. H. Brace, Pittsburgh, Pa. App. filed Jan. 16, 1919.

1,678,054. TUBULAR INSULATOR; E. H. Buckley, Philadelphia, Pa. App. filed Oct. 27, 1925. For lead-in wire of radio antenna.

1,678,059. HEATER; W. H. D'Ardenne, Philadelphia, Pa. App. filed Dec. 8, 1926. Electrical unit in combination with a circulating water system.

1,678,082. PLUG AND SOCKET CONNECTER AND THE LIKE; H. Rottenburg, Cambridge, England. App. filed Feb. 18, 1926.

1,678,129. TAP CHANGER; G. H. Tuttle, Warren, Ohio. App. filed April 13, 1927. Located within the transformer tank and operable from the exterior.

1,678,131. SAFETY FUSE; T. L. Vaughn, Jr., Charlotte, N. C. App. filed Jan. 4, 1926.

1,678,138. CIRCUIT CONNECTER; H. A. Douglas, Bronson, Mich. App. filed Nov. 17, 1927. For miniature lamps.

1,678,182. TRANSMITTER FOR HIGH-FREQUENCY SOUND SIGNALING; M. E. Estes, New York, N. Y. App. filed Nov. 25, 1919.

1,678,187. ELECTRICAL CUT-OUT; W. H. Illingworth, Halifax, England. App. filed July 12, 1922.

1,678,205. BLOW-OUT DEVICE; C. W. Wyman, Claremont, N. H. App. filed April 10, 1922. For use on mining mechanisms.

1,678,217. TIME-CONTROLLED CIRCUIT CONTROLLER; R. R. Gonsett, Los Angeles, Calif. App. filed Aug. 12, 1926.

1,678,224. LEAD STORAGE BATTERY; A. Kastelic, Richmond, Calif. App. filed Jan. 28, 1926.

1,678,249. FIXTURE E. O. Frederics, New York, N. Y. App. filed Aug. 23, 1926. For use in connection with the permanent waving of hair and similar operations.

1,678,278. RECIPROCATING ELECTRIC MOTOR; C. S. Weyandt, Pittsburgh, Pa. App. filed May 2, 1924.

New Trade Literature

ELECTRIC RANGES. — The Standard Electric Stove Company, Toledo, Ohio, has issued catalog No. 16 describing and illustrating its line of electric ranges. The catalog contains facts and figures covering the electric range. It also contains a list of toasters, broilers, griddles, coffee urns, etc. A list of accessories and repair parts also is included.

WIRE CONNECTORS.—The Ideal Commutator Dresser Company, Sycamore, Ill., is distributing a leaflet describing the "Ideal" universal wire connectors.

CONDUIT FITTINGS. — The Crouse-Hinds Company, Syracuse, N. Y., is distributing bulletin G-7 covering its "Groundulets" and other safety circuit devices. The company has also issued bulletin G-8, entitled "Ground for Safety," in which the use of bonded conduit is illustrated and described.

STEEL HOUSE FRAMES. — A catalog issued by the Walter Bates Steel Corporation, Gary, Ind., illustrates and discusses the adaptation of its steel house frames to actual homes. Of particular interest are the illustrations and equipment of Walter Bates' own home, which uses welded steel construction and electrical equipment throughout. Detailed construction drawings are also included.

INDUCTION MOTORS, ETC.—The General Electric Company, Schenectady, N. Y., is distributing the following bulletins: GEA-457A describing its squirrel-cage induction motors, GEA-714A describing its MD-400 direct-current mill motors, GEA-869 covering the CR7006-D31 magnetic switch for alternating-current motors, GEA-961 covering its sheath-wire resistor units for cable reel motors, GEA-994 covering its travel carriage for automatic arc welders, GEA-944A covering radio telephone equipment for train communication and GEA-439B, entitled "A Short Cut to the Solution of Floodlighting Problems."

BALL BEARINGS.—The New Departure Manufacturing Company, Bristol, Conn., has issued a catalog entitled "More and Better Production at Less Cost," in which it deals with ball bearings in machine tools. Many illustrations of ball bearing installations are included.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

Purchase is desired in Montreal, Canada (No. 32,443), of automobile starting and igniting equipment; another (No. 32,441), of electrical fixtures, and another (No. 32,442), of electric washing machines.

Purchase and agency are desired in Rosario, Argentina (No. 32,560), for electric curling irons and permanent waving machines.

An agency is desired in Berlin, Germany (No. 32,445), for electric dish-washing machines.

Purchase and agency are desired in Calcutta, India (No. 32,563), for electric heating and cooking devices and rubber-covered and cotton-covered wires.

An agency is desired in Cairo, Egypt (No. 32,452), for household electrical appliances, and another (No. 32,430), for incandescent automobile lamps.

An agency is desired in Hamburg, Germany (No. 32,508), for household electrical appliances.

An agency is desired in Havre, France (No. 32,453), for electric refrigerators.

Purchase is desired in Buenos Aires, Argentina (No. 32,440), of refrigerators, electric stoves, vacuum cleaners, washing machines and electric signboards.

Purchase is desired in Jerusalem, Palestine (No. 32,528), of electrical refrigerators and water coolers.

Purchase is desired in Belgrade, Yugoslavia (No. 32,444), of copper, bare and insulated wires and cables.

Purchase and agency are desired in Belgrade, Yugoslavia (No. 32,548), for insulated wires and cables.